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Gates and Risers for Good Castings

How Their Proper Arrangement Avoids Many Troubles—Methods of Skimming Slag and Filling Mold

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GATES and risers are to a mold what food is to our bodies. Proper food means a good, healthy body free from aches and pains and a smooth skin with no imperfections on the surface. Proper gates and risers mean good castings free from blow holes, sand, slag and shrink cavities, with a smooth, clean surface. It is true that we can produce a defective casting even though we have the gates and risers properly made; but it is also true that we can have our bodies in perfect health and break a limb or lose an eye. A healthy body or a properly gated mold represents 75 per cent of the battle won. For this reason I believe too much cannot be said about gates and risers and their influence on the quality of the casting produced.

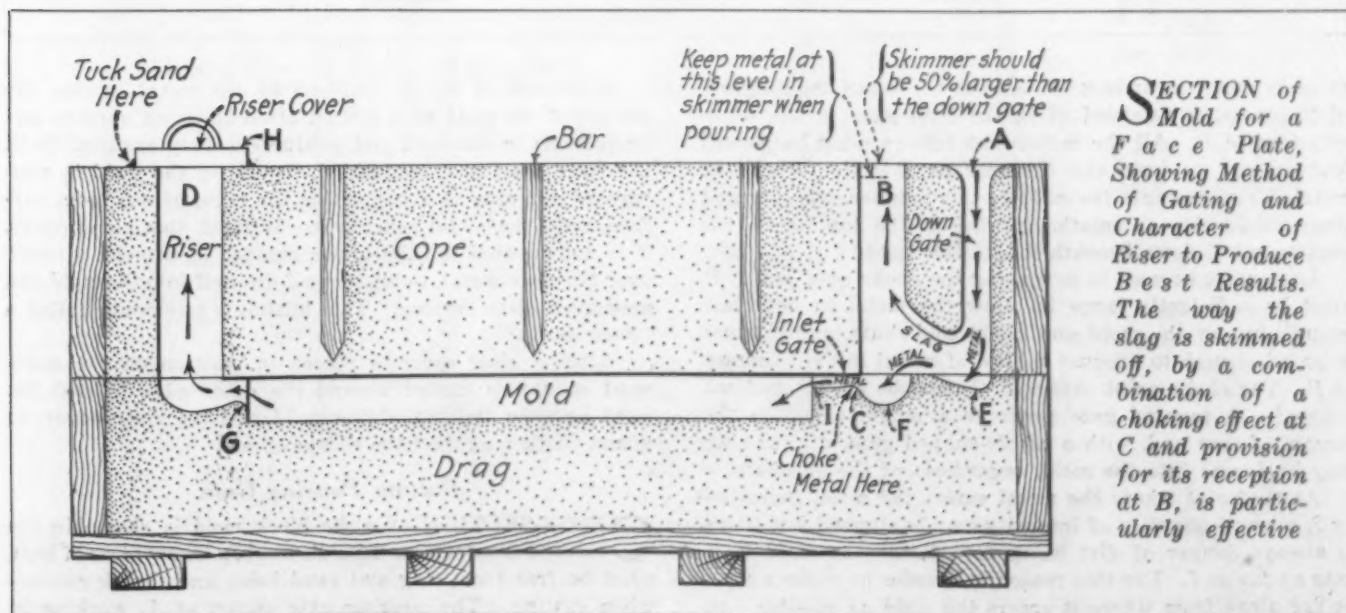
A foundry engineer, when designing molding equipment for quantity production of castings, considers first where and how he is going to gate the mold; where he is going to

place the risers or feeding heads (riser is often called feeding head). After he has settled this question he is ready to consider other details, such as parting the mold, holding the cores in place and carrying off the gas. He decides upon the gates and risers first, because they are the most important.

In the job shop where the work varies from day to day the molder must make his own gates and risers, and decide where they are to be placed and the kind he must use. Consequently it is very important that he should have a thorough knowledge of the subject. It is the author's intention to give as much information as possible that will help him decide on his plan of gating and feeding the many different molds that he makes.

All of the metal entering the mold must pass through the gate; consequently the gate must receive the same attention that is given the mold. The sand must be as well mixed; the escape of the gas must be provided for. As there is more danger of a gate cutting than of a mold cutting, the gate must be surrounded with the same facing sand that is rammed around the pattern. Just as much care

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SECTION of Mold for a Face Plate, Showing Method of Gating and Character of Riser to Produce Best Results. The way the slag is skimmed off, by a combination of a choking effect at C and provision for its reception at B, is particularly effective

must be used in ramming around the gate as in ramming around the pattern.

To prevent any impurities from entering the mold with the metal, the pouring gate must be kept full during the pouring process. As this cannot be done if the gates are too large, it is good practice to choke the flow somewhere between the ladle and the mold.

These are things that the molder must always have in mind in making his gates and risers.

Gating a Face-Plate Mold for an Iron Casting

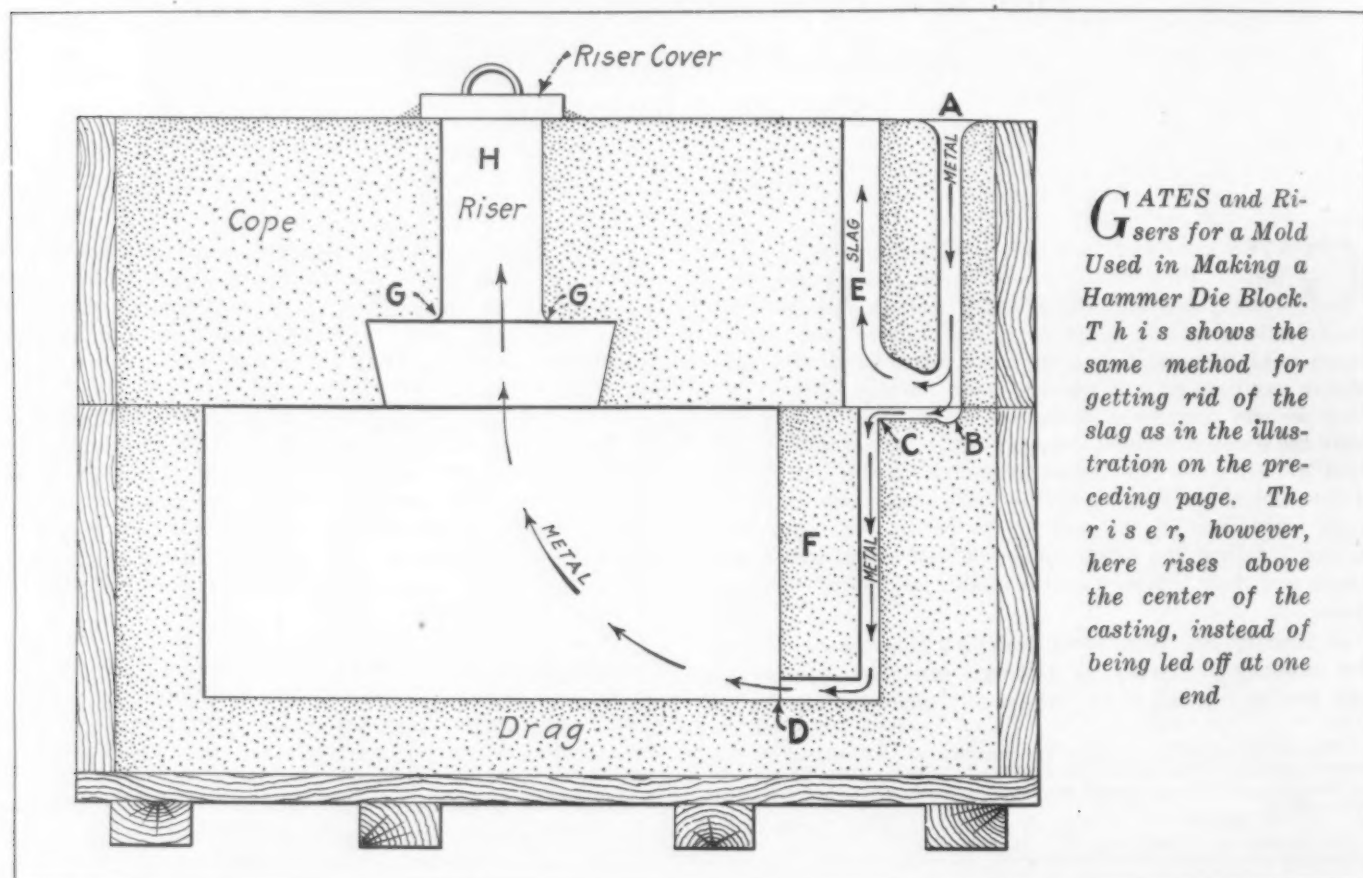
A CROSS-SECTION of a mold for a face plate is shown in the first illustration. This casting must be very clean and free from dirt or slag. A single skim gate is used on this mold; if it is properly made, and the gates are kept full during the pouring, a clean casting will be produced.

Hot metal is poured from the ladle through the pouring gate at A. The first metal must be poured very quickly,

the same time it must be remembered that if the small gate, or channel, that extends from the choke to the mold is too long, there is danger of the metal in this channel chilling, thus closing the inlet gate entirely.

The surface of the basin at E must be soft enough to prevent the metal from cutting into it. The same applies to the basin F directly under the skimmer. Also, the gate surface between these two points must be soft, because the metal flowing over this area will cut if the surface is hard, and produce more dirt than can be carried off by the skimmer.

A side riser, D, is used on this mold, with a fillet at G, where the riser is connected with the mold. This fillet is provided to prevent the riser from breaking into the casting when it is removed. The riser cover H should be made of cast iron heavy enough to fit snugly over the riser. The function of the riser cover is to prevent air from rushing from the mold through the riser.



GATES and Risers for a Mold Used in Making a Hammer Die Block. This shows the same method for getting rid of the slag as in the illustration on the preceding page. The riser, however, here rises above the center of the casting, instead of being led off at one end

so as to choke the stream of metal at C. When the progress of the metal is retarded at C, the level rises in the skimmer toward B. All the metal that follows must be poured fast enough to keep the skimmer at B full. When the metal is running into the mold in this manner, the slag and other impurities automatically rise to the top, while the heavier metal flows beneath it into the mold.

Care must be used in preparing the choke gate at C. It must be sufficiently large to allow the metal to flow fast enough to run the mold and avoid cold-shuts, and it must be small enough to produce a head of metal in the skimmer at B. The choke point shown at C must be abrupt and not tapered. A tapered gate produces a nozzle effect on the stream of iron and, with a nozzle-shaped gate, dirt or slag may be forced into the mold, regardless of the skimmer.

At the point where the metal enters the mold, indicated by I, a small quantity of impurity may be stopped, but there is always danger of dirt being forced into the mold if it gets as far as I. For this reason it is safer to choke a gate as far away from where it enters the mold as possible. At

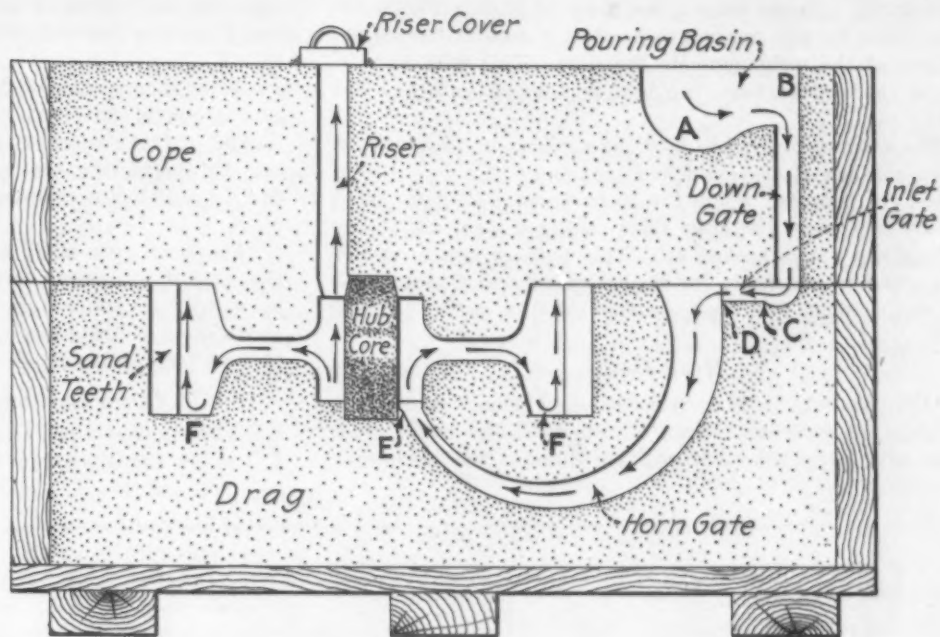
A current of air is produced by the metal forcing the air out of the mold as it fills; it often blows off corners and projections in the mold and produces a dirty casting. With the riser cover properly sealed, the air in the mold is compressed and acts as a support to the cope, or top mold surface, until the metal reaches it. Without this air support, it is not unusual for the upper surface of a mold, directly over the riser metal, to blister and drop off into the mold and produce a dirty casting. This blister is commonly called a "burn down."

After a riser cover is placed in position on the mold, sand should be tucked around the outer edge to seal the joint between the top of the mold and the riser cover, to guard further against the escape of air.

Bottom Pouring Gate

CROSS-SECTION of a die block mold is shown in the second illustration. This die block, a heavy piece of iron, must be free from slag and sand holes and shrink cavities when casting. The pouring gate shown at A, working in

HORN Gate for a Gear Mold, Used to Avoid Damage to the Molded Teeth. Here the pouring basin is large enough to take care of slag. The riser leads from the heavy hub section. Metal from the gate flows outward in all directions from the hub



conjunction with skimmer *E* and the choke shown at *C*, will, if the metal is properly poured, produce a casting free from slag.

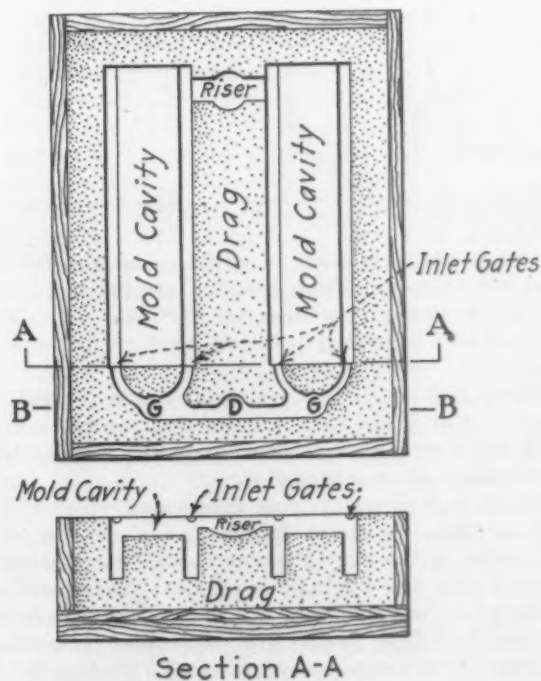
The bottom pouring gate leads the metal from *C* to the mold, which it enters at *D*. This mold is gated at the bottom because the fall of the metal to the joint of the mold, at the bottom, would be so great that the hot iron would be likely to cut into the surface of the bottom and produce sand holes in the casting.

In this case the single skim gate and choke at the joint prevent slag holes, and the bottom pouring gate prevents sand holes. The skim gate at the joint would not insure a clean casting without the bottom pouring gate, because the

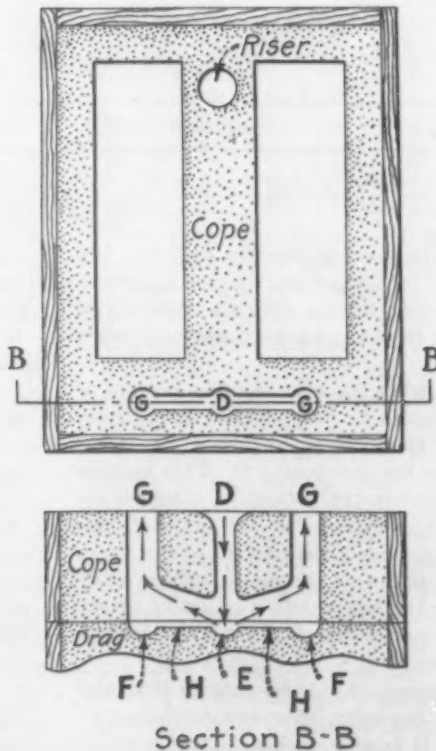
falling metal would cut the mold and produce sand holes. The bottom pouring gate, without the skim gate on the joint, would not insure a clean casting, because there would be danger of slag entering the mold. This is why a mold of this kind should be poured with the skim gate and bottom pouring gate combined.

Metal enters the gate at *A* and drops on the soft basin at *B*. The stream is choked at *C*, causing the slag to rise in the skimmer *E*, after which the metal proceeds to the mold through the bottom pouring gate. The usual care must be used in making the basin *B* and the channel to *C* soft enough to prevent cutting.

The space between the bottom pouring gate and the



Section A-A



Section B-B

DDOUBLE Skim Gate for Mold for Two Driving Box Shoes for Locomotive. Slag skimmers at *G, G*, and four inlet gates, feature this mold. A single riser serves both castings

mold proper, indicated by *F*, must be supported by rods to prevent its collapse before the mold is filled. This same space must be well vented, to prevent a scab or cut on the surface of the mold opposite the gate. This will occur if gas is confined between the bottom pouring gate and the mold.

The riser is covered to hold the air pressure against the upper surface of the mold and thus prevent a burn-down. Fillets are provided where the riser connects with the mold at *GG*, to prevent the riser from taking a piece out of the casting when it is broken off. This plan of gating should be applied to all molds for heavy, chunky castings, where the metal must fall some distance on the surface of the mold.

Horn Gates

THE third sketch is a cross-section of a mold for a spur gear. In pouring a mold of this kind, the metal must enter at a point where it will not damage the teeth that

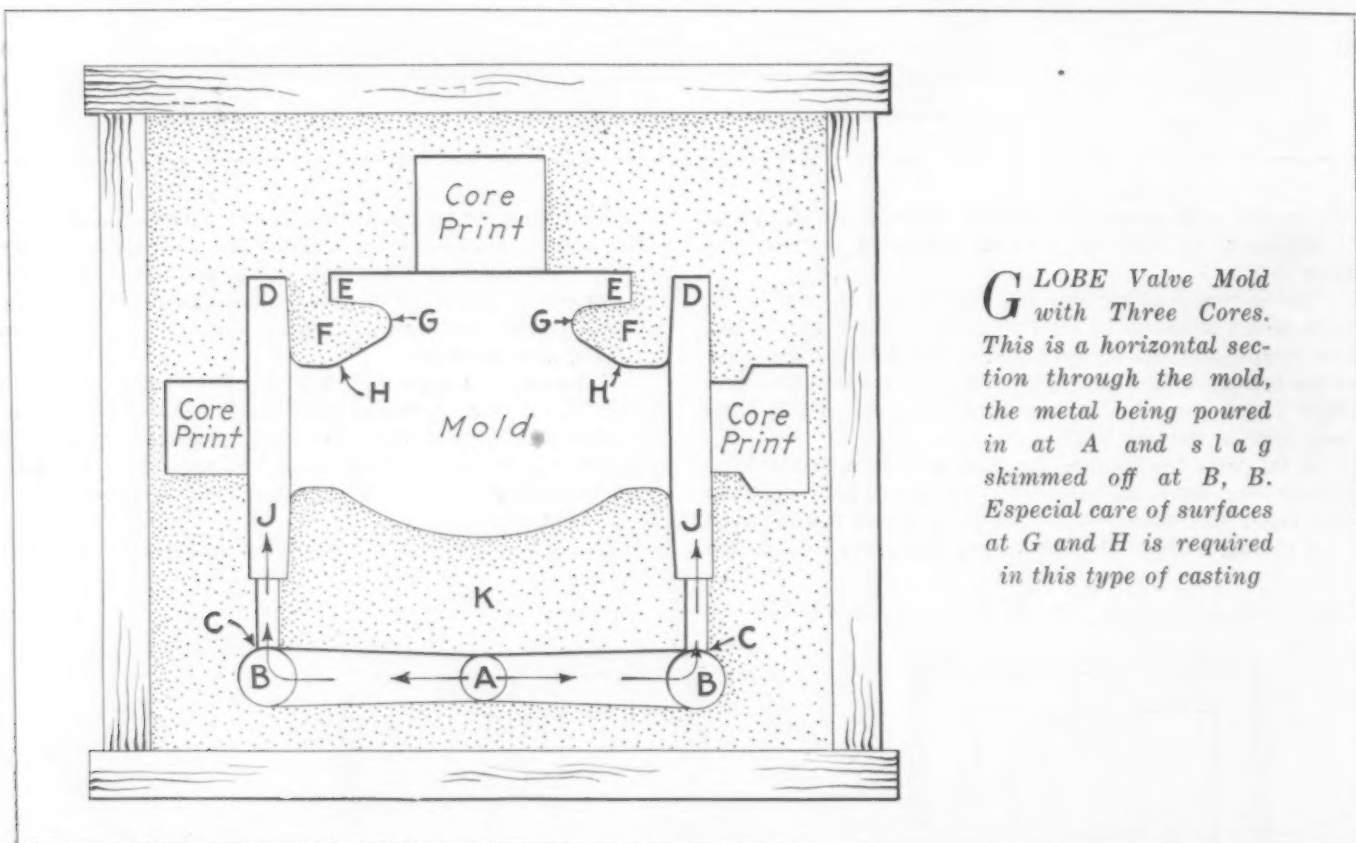
flows through the horn gate, under one section of the mold and into the bottom of the hub at *E*. From there it rises and flows over the web surface gently to the point indicated by *FF*.

After the mold is filled, the metal rises to the top of the cope through the riser. A riser cover should be used in a mold of this character, as the current of air produced by the metal entering the mold is likely, otherwise, to blow down the delicate columns of sand that produce the gear teeth.

The horn gate must not be too close to the bottom of the mold it is passing under. In such a case there would be danger of the gate's breaking into the mold directly above it, or confined gas causing a cut or a blow in the bottom surface of the mold.

Mold for Locomotive Driving Box Shoes

FOUR cross-sections of a mold for locomotive driving box shoes are shown in the fourth illustration. In this



GLOBE Valve Mold with Three Cores. This is a horizontal section through the mold, the metal being poured in at *A* and slag skimmed off at *B, B*. Especial care of surfaces at *G* and *H* is required in this type of casting

are formed in the sand. To pour it directly into the hub from a pouring basin would be dangerous, because the metal would splash and strike some of the delicate sand teeth. The best and safest plan is the use of a horn gate as shown here.

Hot metal enters the pouring basin at *A*. The bottom of this basin must be soft enough to prevent the metal from cutting, and a little lower than the point where the metal leaves the basin and enters the down-gate *B*. This is done to provide a cushion of metal in the bottom of the pouring basin for all the metal that follows to fall on. If this cushion of metal were not provided, the bottom of the basin would be cut away by the action of the metal before many pounds had flowed through the basin, and a quantity of the sand cut away in this manner would find its way through the down-gate to the mold.

The metal proceeds through the down-gate to the inlet gate, which connects with the horn gate and is choked at the point indicated by *C*. It is also choked at the point *D*, where the inlet gate connects with the horn gate. The metal

case two castings are made in one flask and a double skimming gate is used. These castings are machined on all sides and must be free from sand or slag. The double skimming gate is necessary to take care of the impurities properly.

Section *B-B* shows how the metal enters the gates. It is poured in at *D* and falls to basin *E*, from which it flows to *F-F* and rises in the two skimmers *G-G*. The plan of the cope is shown above section *B-B*.

Section *A-A* shows the four inlet gates, which are very small, to choke the metal. In the plan above section *A-A* the location of the two skimmers *G* and the pouring basin *D* can be seen, and the inlet gates also. These inlet gates are located so that the metal will drop to the bottom of the flanges and fill these flanges first, to prevent the surface at the flanges from being cut by the metal. When metal flows over a bare surface it is likely to scab and create a dirty casting. The plan should always be to have metal falling upon metal as early as possible in the pouring operation.

The inlet gates should be small enough to choke the

metal as it passes *G*, shown at left, and cause the skimmer to fill immediately. The riser is shown in the cross-section *A-A* and in the plans. Further to insure a clean casting, the riser must be covered during the pouring operation.

This plan of gating with the double skimmer and the proper size inlet gates will produce a clean casting, provided the facing is correctly mixed and the mold is clean before it is poured. The skimmer at *G-G* must always be at least 50 per cent larger than the pouring gate *D*. This makes it easier for the impurities to rise to the surface of the skimmer.

A single skim gate, as was shown in the first illustration, would not be practical when molding two of these castings in one flask, as one of the castings would be located too far from the single skimmer and there would be danger of dirt being collected between the skimmer and the casting. In all cases it is advisable to have the skimmer reasonably close to the mold.

Drag Section of a Globe Valve Mold

THE drag section of a globe valve mold shows how the double skimmer should be used in gating this type of mold. Metal entering the pouring gate *A* flows, as indicated by the arrows, to the two skimmers *B-B*. Here the metal is choked at *C*, where it enters the inlet gates and flows into the mold at *J-J*. This plan is the best method for gating globe valves; it not only insures a casting free from slag but also free from sand holes. The casting will be free from slag because the method of gating with the double skim gate will make it impossible for the slag to enter the

mold. If the skimmers are kept full during the pouring process the casting will be free from sand holes, because the metal dropping into the flanges from the side of the mold indicated will not cut or damage the surface of the mold.

The mistake made by many molders who have worked at the business for years is to gate castings of this character at the points of the mold indicated by *D* or *E*. This is done to enable them to use a smaller flask. But it is false economy, as a number of castings rejected on account of sand holes caused by the gates being located at these points will increase the cost more than the use of a larger size flask. The reason the gates that enter the mold at *D* or *E* produce dirty castings is that the sand pockets marked *F* are completely surrounded by the metal and the gates prevent free escape for the gas from these pockets. A frequent result is that the surface of these pockets, at *G-G* and *H-H*, scab and cut, and the loose sand that cuts off from them is found later on the surface of the casting.

In making a double skim gate for a globe valve, care must be taken not to have the space too small between the pouring gate and the edge of the mold proper. If this point is not given consideration, there is always danger that the pouring gate will break into the mold at the point indicated by *K*. Another danger of having the pouring gate too close to the mold, even though the gate does not break in, is that, when it is too close, it is difficult for the gas to escape, and there is a possibility of a scab on the mold, directly opposite the pouring gate.

(To be continued)

Where Our Finished Steel Exports Go

United States Ships Less Than Certain Other Countries;
Distribution Is World-Wide

POINTING out that while the United States ranks first in steel production of the world, but is fifth in the volume of steel exports, Luther Becker, chief of the Iron and Steel Division, Department of Commerce, sketched the distribution of American steel in addressing a group session at the formal opening early in October of the department's new district office in Pittsburgh. As a steel exporting nation, Mr. Becker said, the United States is surpassed by France, Germany, Great Britain and Belgium-Luxemburg, in the order named. Of these France, the greatest distributor of steel today, sold 2,300,000 tons in foreign markets in the first half of this year, Germany and Great Britain each but 150,000 tons less, and Belgium-Luxemburg slightly less than 2,000,000 tons. The United States trade over this period, it was stated, totaled 1,350,000 tons, with export sales increasing.

"These figures do not present quite the true picture of this relationship, however, for whereas virtually all of the exports of the United States go to non-European areas, a good part, if not the bulk of the sales, of those countries which exceed the United States are among themselves. Belgium supplies sheet bars to Great Britain and receives finished black and galvanized sheets in return, and so on. Further, these figures do not reveal the tremendous pressure which extensive excess capacity brings to bear on the European steel maker, and which make export sales of his steel a vital necessity. It is not exaggerating to say that France must export between 40 and 60 per cent of her output to utilize her present capacity effectively and economically, Germany and Great Britain from 20 to 35 per cent, and Belgium-Luxemburg from 60 to 75 per cent."

After stating the production of steel of the various pro-

ducing countries, Mr. Becker declared that, with one exception, tin plate is the principal steel product exported from the United States, this trade in 1927 having totaled 254,000 tons. Although we are the largest producer in the world of tin plate, it was pointed out, our exports of this product are exceeded by those of Great Britain. Being without such colonial markets as Great Britain enjoys in India, Australia and South Africa, the United States sells tin plate in virtually every country of the world.

"American rails found almost as wide employment in foreign lands, the 178,000 tons exported last year having been laid down at points as widely separated as Belgium and Mozambique and Canada and Uruguay," said Mr. Becker. "American rails grooved for street railway use carry the street cars of Spain, light rails climb the slopes of the Chilean Andes, linking mines with seaports, and heavy rails have gone into Manchuria, aiding in the development and industrialization in progress there under Japanese direction.

"Black and galvanized sheets are two other leading items of our export trade, export sales of each having aggregated approximately 150,000 tons last year. Galvanized sheets, however, find wider range than black steel sheets, the markets for the latter being frequently those in which galvanizing plants are already set up. American galvanized sheets were imported, during 1927, into Iceland and, although not braving the blasts from Greenland's icy mountains, they did feel the torrid heat of India's coral strand. They sheltered blacks in the Congo and Liberia, yellow men of China and Mongolia, brown men of Malaya and the East Indies, as well as whites throughout Europe, America and South Africa."

Gear Manufacturing Methods Discussed at Buffalo Meeting

LARGE attendance and active participation in a program of broad scope marked the fall meeting of the American Gear Manufacturers Association, held at the Hotel Statler, Buffalo, Oct. 11, 12, and 13. Problems met in the production of high-speed gearing were reviewed, and data on new facilities for finishing and testing gears reflected further advance in gear manufacturing methods. There was also a paper on the advantages of arc welding as a manufacturing tool.

Although no recommended practices were presented for adoption by the association, progress reports were made by several of the standardization committees, as noted below.

A joint session with the machine-shop practice division of the American Society of Mechanical Engineers was a departure. The success of this arrangement was indicated by expressions favoring the same arrangement for future meetings in large cities.

Visits were made to the plants of the Farrel-

Birmingham Co. and the Lumen Bearing Co., Buffalo. Members of the association were guests at a luncheon Oct. 12, given by A. A. Gloetzner, president of the Covert Gear & Mfg. Co., Lockport, N. Y.

E. J. Frost, past-president of the association, who recently disposed of his interest in the Frost Gear & Forge Co., Jackson, Mich., which required him to resign as a member of the executive committee of the A. G. M. A., was elected to honorary membership in the association. A. A. Henninger and D. A. Searle were admitted as executive representative and associate representative, respectively, of the New Process Gear Co., Syracuse, N. Y.

A. F. Cooke, vice-president Gears & Forgings, Inc., Pittsburgh, presided at the regular sessions and E. W. Miller, chief engineer, Fellows Gear Shaper Co., was chairman of the A. G. M. A.-A. S. M. E. joint session.

The next meeting of the association will be held in Cleveland during May, 1929.

Gives Comprehensive Data On High-Speed Turbine Gearing

INTERESTING data relating to reduction gearing of helical-tooth type were given in a paper on "High-Speed Turbine Gearing" by Ira Short, marine engineer, South Philadelphia Works, Westinghouse Electric & Mfg. Co., at the session held jointly with the shop practice division of the American Society of Mechanical Engineers. The paper dealt with the reduction gears furnished by the Westinghouse company, which since 1909 has built more than 3000 geared units ranging from 5 to 32,500 hp. and totaling well above 2,500,000 hp.

Action of the teeth of the gears was discussed and data relating to wear presented. Two distinct types of wear were said to occur at the meshing faces of the gear teeth, one being a regular change in the shape of the tooth profile, and the other the formation of a number of cavities or pits on the tooth face. From a photographic study of the first type it was to be seen that the wear varies considerably over the profile and is greater below the pitch line than above. There is considerable wear at the tips of the gear teeth but very little at the pitch line. In several installations it has been found that the metal flowed because of the combined rolling and sliding action until the thickness of the gear teeth at the pitch line, after being in operation for some time, was actually greater than when the gear was originally put into service. It is believed that the metal flowing from the tips of the gear teeth has maintained the pitch line very close to the original thickness.

The second type of wear, the formation of pits or cavities on the meshing faces, has been explained in a number of ways, but, according to Mr. Short, fatigue of the metal seems to be the best explanation. "The conditions are such at the point of contact between two meshing teeth that it is difficult to form an exact idea of the actual stresses set up. The stresses have been investigated by photoelastic methods, and it appears that a maximum shear stress occurs a short distance below the surface and travels along with the point of contact. Should there be any slight imperfection in its path or some irregularity on the meshing surfaces, the stress will be considerably increased and by repeated application will cause a crack and finally a pit.

"Pitting is considered to be in the nature of a corrective agency as metal is removed from the high spots, allowing the surrounding areas to carry their share of the load. It is found that pitting generally starts on a new machine shortly after it is put in service, and gradually decreases and finally stops completely after a few months."

A section of the paper was devoted to methods of lubricating the gear teeth and another to noise and its elimination. Noise from a gear is traceable to reproduction in the gear of errors in the hobbing machine, variable deflection of gear teeth with phases of tooth contact, and vibration transmitted from the connected machine. The arrangement of the hobbing machines used by the Westinghouse company for its high-speed gears was described and illustrated, special mention being made of the methods employed to assure accuracy of the master worm wheel. All parts of the hobber are checked periodically. The lead screw, also checked regularly, must not show an error exceeding 0.0005 in. per ft. in length.

The origin of noise emitted from a gear is traced by means of an instrument consisting of a portable cylinder and piston connected to ear pieces. The method of using this instrument was described by Mr. Short as follows: "The piston is moved in the cylinder until the air column in the latter is in resonance with the sound from the machine, when the sound will be heard distinctly. In using this 'resonator' the length of the air column is first made very short and gradually increased in length until the maximum sound is heard, when the length of the air column is noted. The piston is then moved further until the same note is again heard, and the length of air column is noted. The distance between these two points is then exactly one-half wave length of the sound. Knowing the velocity of sound to be about 792,000 in. per min. under average conditions and by noting the speed of the machine at the time of checking the sound wave, the sound waves per revolution can be determined from the formula—

$$\text{Waves per rev.} = \frac{\text{Velocity of sound, inches per minute}}{\text{R.p.m. of machine} \times \text{wave length in inches}}$$

"Knowing the waves per revolution, the source of the sound can generally be traced. A hobbing-machine error

will generally show up as the same number of sound waves per revolution as there are teeth in the master wormwheel.

"On all gears a note will be heard corresponding to one sound wave per tooth on the wheel. This note can be reduced to a minimum by using the 'even contact' design, which insures a constant deflection of the teeth."

Several typical gears were illustrated by lantern slides and a model of a double-reduction marine gear for transmitting 3000 s.h.p. on two pinions with a reduction of 3340-585-90 r.p.m. was shown.

Gear Teeth Finished by Shaving Process

THE Pratt & Whitney gear-shaving process, invented by James H. Barnes, Dayton, Ohio, was described by H. D. Tanner, manager of the gear division of the Pratt & Whitney Co., Hartford, at the A.G.M.A.-A.S.M.E. joint session.

In this process the teeth of unhardened gears are finished in an automatic machine, designed for the purpose, to conform to the theoretically correct involute curve, a small amount of material being shaved from the tooth faces and flanks of the gears.

After explaining the underlying principles of the process, Mr. Tanner said: "It now becomes apparent that the process is one of zero-degree generation and that the active profiles of the gear teeth are generated by rolling the gear in mesh with a zero-degree rack. The active profiles of this rack are the top edges of its teeth, which coincide with the cutting edges of the tools. The remainder of the profile of the rack does not come in contact with the

gear. We are then required to make tools with straight cutting edges slightly longer than the face of the gear to be cut and to place the tools in the shaving machine with their edges lying in a plane tangent to the base cylinder of the gear. If the edges are parallel to the center line of the gear, a spur gear will be produced. If they are parallel to each other but at an angle to the center line of the gear, a helical gear will be produced."

A large cam, with two opposed involutes and two cam rolls are used in the machine and two cutting tools are employed. The component parts, including the master involute cam, which is the only precision form used in the machine, were described in detail. The milling and grinding of the involute profiles of the master cams was also outlined. Operation of the machine was shown by means of moving pictures.

Discusses Methods of Checking Gear Quality

ISTRUMENTS of both "elemental" and "integrating" type, for maintaining the quality of gearing, were reviewed by Russell M. Coldwell, Fellows Gear Shaper Co., in a paper on "Predetermining Gear Quality."

As the term implies, instruments of the first class are for checking the elemental characteristics of gears. The integrating measuring instruments "combine the elemental errors so that the effect of the combination of errors may be predetermined." Of the latter class a machine designated as the Red Liner, which records errors in gears by means of a pen on a constantly moving chart, was described in detail.

Gear Lapping Facilitated by Manufactured Abrasives

CARE in selecting lapping media, whether the lapping is done for smoothing or fault correcting, was emphasized by H. J. Willis, research engineer, Carborundum Co., Niagara Falls, N. Y., in a paper on "The Manufactured Abrasive In Gear Lapping."

No one abrasive is suitable for more than a few types of gears, said Mr. Willis. Hardened gears having a sliding action require a hard sharp grain, which if used on soft gears having a rolling action would prove disastrous. Gears having both rolling and sliding action require a still different abrasive.

Natural abrasives were said to vary widely in purity, which seriously affects the quality of work they do. Generally speaking, nearly all of them are suitable for polishing only. Ground glass, it was stated, is not suitable for hard gears and is too splintery for soft. It is generally of poor grading and varies in quality. Because of its resistance to crushing, it is harmful to bearings.

Manufactured abrasives discussed were made of crystalline alumina and carbide of silicon. Some grades of the former are suitable for soft gears having sliding action, but are too soft for hard gears, especially of the rolling type. It is uniform in quality and grading. Carbide of silicon is suitable for hard gears of any class; but is too sharp for soft gears. It is made both green and black, the latter being best for gear work.

Abrasive Selected for Softest Gears In Train

In all cases the abrasives must be selected for the softest gears in a pair or train. "It is not sufficient, either, merely to select the kind of grain of the common gradings that are available," said Mr. Willis. "Research in gear lapping, particularly of spiral bevels, has demonstrated that a closely graded grain that will cut fast enough for commercial lapping is too harsh and will leave deep grain marks. Consequently, packing with a well selected grit is required to combine good finish with speed." To meet this situation, the Carborundum company has developed a carbide of silicon grain, designated as the RAA, for use on spiral bevel and hypoid gears. It is particularly adapted for lapping where considerable metal is to be removed.

The usual practice in lapping these gears is to make up a batch of grain and oil and use it until it is exhausted or the grain is broken down. To offset the constant change

in lapping action as the grain breaks down, fresh grains and oil are added daily. This perpetual mix idea was advocated strongly.

It was stated that too little attention is given to the selection of the vehicle for carrying the grain. Some of the defects of oils, soaps and greases, when used with abrasives as lapping media, were discussed, and specifications of the ideal vehicle given.

"Heavy oils and greases will suspend the grain fairly well," said Mr. Willis, "but are messy, hard to clean and generally retard the cutting. Thin oils work faster but will not suspend the abrasive unless the proportion of grain to oil is excessive. Grain must not be present in the vehicle much in excess of 25 per cent, in order to allow spaces for the removal of metal and to permit the free and individual abrasive action of each grit. But grain in this proportion in any kind of oil will not be stabilized, because it will generally form in pockets. Many complaints on quality of grain can be traced directly to these pockets and to the variables in oils and grain proportions."

A "finishing compound" that is said to be free from the variables mentioned has been developed by the Carborundum company and is available for each of 10 major lapping operations, with several grades of fineness for each. Particularly pleasing progress was said to have been made in gear lapping, the time for finishing straight worms having been cut 62 per cent in lapping, and soft spur gears and helicals, 68 per cent. For spiral bevels the development is too recent to make definite statements.

Lapped gears should be cleaned off thoroughly regardless of what abrasive is used, said Mr. Willis. He maintains that there are neither natural nor manufactured abrasives that will crush down to a degree of fineness that it will be harmless to gears and bearings. Researches by the company were said to have produced a grain in a compound that is suitable for the running in of plain bronze or babbitt bearings without impregnating the bearings.

Advocates Arc Welded Steel Construction

THE importance of arc welding in making possible the application of steel, with substantial economies, where cast iron has usually been employed, was emphasized by J. F. Lincoln, vice-president and general manager of the

Lincoln Electric Co., Cleveland, in an address on "The Effect of Arc Welding on Manufacturing."

Motors, arc welding machinery and other products of the company in which welded steel parts are used in place of castings were shown by lantern slides. Redesign of

many of these parts to permit the use of welded steel was begun several years ago, and it was stated that, in general, there has been a reduction of at least 50 per cent in the cost of these parts. An abstract of Mr. Lincoln's address will be given in a forthcoming issue of THE IRON AGE.

Gear Standardization Work Going Forward

REPORTS submitted by the several subcommittees of the general standardization committee, which is headed by B. F. Waterman, engineer, Brown & Sharpe Mfg. Co., Providence, and vice-president of the association, indicate definite progress. No recommended practices were offered for adoption, but it is expected that several of the projects will be ready for presentation at the next meeting. Round table gatherings of the subcommittees were held, as heretofore, for the purpose of formulating plans for work over the next six months. The status of some of the standards work is given in part below.

Working on Alloy Steel Specifications for Gears

AN analysis of 54 replies to a questionnaire relating to alloy steel specifications for gears, sent to the association's membership, was presented by Chester B. Hamilton, Jr., Hamilton Gear & Machine Co., Toronto, Canada, chairman of the metallurgical committee.

Alloy steels which, according to the replies to the questionnaire, should be retained, include S. A. E. No. 2315, 3½ per cent nickel, case hardening; No. 3115, low-chrome nickel, case hardening; No. 3215, medium-chrome, medium-nickel, case hardening; No. 3312, high-chrome, high-nickel, case hardening; No. 3340, high-chrome, high-nickel, in the hardening and tempering grade; and No. 6120, chrome-vanadium case hardening steel. S. A. E. No. 2350, 3½ per cent nickel, hardening and tempering steel is also retained but No. 2345 is dropped, because the No. 2350, with suitable draw back, will meet the requirements.

No. 3145, low-chrome, low-nickel, in the hardening and tempering grade, was the subject of a special question and is still before the committee. This is not an S. A. E. steel. S. A. E. 3245, medium-chrome, medium-nickel steel in hardening and tempering grade, is indorsed by a large majority. However, a number of replies advocated a change to No. 3250, and it was pointed out by Mr. Hamilton that there is evidently a strong feeling in this direction among S. A. E. users of this steel. S. A. E. 6150 chrome-vanadium steel, hardening and tempering grade, will be retained and 6145 dropped, because the former with suitable draw back will meet all requirements. S. A. E. 2512, a 5 per cent nickel case hardening steel, will be added, 98 per cent of those replying to the questionnaire being in favor of it.

It is expected that the committee will not include the new high-manganese case hardening steels in the A. G. M. A. list of standard specifications.

Spur Gear Tables Compiled

TABLES for quickly finding the diameters and necessary dimensions of metallic pinions for various horsepower to be transmitted at various speeds were presented by the spur gear committee, the chairman of which is J. L. Williamson, Fellows Gear Shaper Co., Springfield, Vt. The tables, prepared by L. F. Burnham, Westinghouse Electric & Mfg. Co., East Pittsburgh, are prefaced by a statement of maximum tooth stress and other specific values adopted, the formulas upon which the tables were computed being also given.

The large amount of work done in preparing these tables received favorable comment. B. F. Waterman, engineer, Brown & Sharpe Mfg. Co., Providence, said that the method used was of high value. The possible effect of wear data

being obtained on the Lewis machine at the Massachusetts Institute of Technology was brought up and in this connection Mr. Waterman pointed out that the Lewis formula usually provides satisfactory resistance to wear and that, at any rate, the tables could be supplemented by others based on wear factors established by the data from the tests on the Lewis machine. So far as strength is concerned, it seemed generally conceded that the tables are a good guide.

The tooth form committee, which is headed by H. J. Eberhardt, secretary, Newark Gear Cutting Machine Co., Newark, N. J., reported progress on several items of its program. A table of chordal dimensions for all types of gears is being prepared. Relating to modification of hobs for tip relief purposes, it was stated that the committee cannot at present recommend a fixed amount. "The main difficulty," it was stated, "lies in the geometrical fact that the amount of relief generated varies for each diameter, and therefore gears may have too much of the tooth involute removed and the meshing pinions very little." It was indicated that the present trend was toward less tip relief than formerly, which is in line with improvements in the art of gear cutting and mounting.

Helical and Worm Gear Nomenclature Being Prepared

DEFINITION of backlash as "the shortest distance between non-driving surfaces of adjacent teeth in mating gears" was accepted by the association, at the suggestion of the nomenclature committee, the chairman of which is D. T. Hamilton, Fellows Gear Shaper Co.

Standard nomenclature for helical gears is being prepared and the committee expects to have material ready for the next meeting. Preparation of a standard worm gear nomenclature is also in progress, this work being in conjunction with the worm gear committee, the new chairman of which is W. H. Himes, Westinghouse Electric & Mfg. Co.

Keystock sizes and materials are on the program of the keyway committee, of which R. B. Zerfey, engineer, Tool Steel Gear & Pinion Co., Cincinnati, is chairman. It is planned to formally recommend the use of the low carbon keystock now available for industrial gears. For heavy duty work it was suggested that 40-50-point carbon steel might be recommended, but the consensus of opinion was that only one key material should be standardized; for special cases keystock of special material could be selected.

Tables of dimensions of special keys, such as Barth, Kennedy and Woodruff, will be printed in A. G. M. A. data sheet form by the association's library committee.

The sprocket committee is working along the same lines as the sectional committee on chains and sprockets, of which the A. G. M. A. is one of the sponsors, said G. M. Bartlett, professor of machine design, Purdue University, Lafayette, Ind., chairman of the committee.

Three meetings have been held during the past year by the subcommittee on roller chains and one meeting by the A. G. M. A. sprocket committee. Discontinuance of the present "narrow," "medium" and "light" series of roller chains, and designation of the present "heavy" series as standard has been under consideration. A new series, to be known as the extra heavy, with pitches from ¾ to 2½ in., and inside plate thickness 1/32 in. greater, up to and including the 2-in. pitch, and 1/16 in. greater for the 2½-in. pitch, has been added. A standard light weight machinery chain of ½-in. pitch, ¼ in. wide and with 0.306-in. diameter rollers has also been added. The ¾-in. pitch stan-

dard roller chain has been changed to a rollerless chain with 0.200-in. diameter bushings, 0.141-in. pins and 3/16-in. width.

Specification of standard tolerances for side plates, pins and bushings, to permit interchangeability of the links of various makes of chain, is an important item of the committee's work. Certain dimensions of offset links have also been standardized, permitting interchangeability. Other work of the subcommittee includes modification of the chamfering curve on the sides of the sprocket teeth to improve the action of the chain link in passing over the teeth, especially under conditions of misalignment.

Formulas for the average working loads and horsepower have been worked out to aid in the selection of chain and also formulas for the maximum r.p.m. of sprockets, to aid in the design of chain drives. The discontinuance of the formula for breaking strength is being recommended by the sectional committee.

No definite steps have been taken by the non-metallic gearing committee. T. C. Roantree, Westinghouse Electric

& Mfg. Co., East Pittsburgh, chairman, in presenting a progress report, indicated that the committee intended to introduce a contact duration factor "C" in the horsepower formula for non-metallic gears. The need for such a factor is indicated by the gear tests on the Lewis machine at the Massachusetts Institute of Technology, but changes will not be made until the tests are completed.

A blueprint showing the variation of the working stress with the pitch line velocity of gears of steel, cast iron and phenolic material, making use of the new formula for
150
velocity increment loads, $(\frac{1}{150} + 0.25)$, has been prepared.
200V

This blueprint, which will be issued in A. G. M. A. data sheet form, as supplementary data, shows that gears of phenolic materials are equal in strength to cast iron gears at 1800 ft. per min. and to forged steel gears at 4800 ft. per min.

Institute Visits Spain's Iron Mines

British Organization Meets at Bilbao—Technical Papers Featured by Description of Mining in Vizcaya—Corrosion Also Important Topic

THE autumn meeting of the Iron and Steel Institute (British) in Bilbao, Spain, was more notable because of the opportunities it gave for an inspection of iron mines and steel plants of that country than for technical papers and discussions. Little time was left for the latter, but several papers were presented. Summaries of them are given below. On another page of this issue is an account of the other features of the excursion made by the institute members to Bilbao, repeating a visit to that city made 32 years ago.

Iron Mining in Vizcaya

Main interest centered on the paper of José Balzola of Bilbao, who described iron ore mining in Vizcaya. This paper went over a good deal of the ground covered by the late William Gill, then resident manager of the Orconera Iron Ore Co., on the occasion of the institute's previous visit to Bilbao in 1896, and brought up to date the information then given.

The author estimated that the present workings of the district show a content of some 65 million tons of ore, 40 per cent of which is probably spathic, with a reserve of some 40 million tons, and a further 60 million tons in un-bored parts of the district. The future is dependent on the spathic ore (having a density of 2.8 to 3). The conditions under which the ore has to be extracted, compared with rubio, necessitate a larger consumption of explosives, but this is compensated for by the fact that the faces are much cleaner and the general conditions favor systematic mechanization. On the other hand, 40 per cent more crude spathic ore has to be extracted than the amount of calcined ore obtained, but this also has its compensation in the higher iron content.

Comparing the behavior of first class rubio (having a density of from 2 to 2.5) and first class spathic in the furnace, the author noted that the latter shows higher loss in the flue and its higher sulphur content calls for a more basic slag. Even taking into consideration these disadvantages, a calculation of the comparative furnace changes seems to indicate that the calcined spathic could be 20 per cent higher than that of rubio. That is not the case today, but it is expected that as time goes on prices will be stabilized and that the relation of the price of calcined to the rubio price may reach this percentage. In this compari-

son the calcined spathic has been assumed to have no further treatment and to be used alone. In practice this is not feasible, but the ore sinters very well, and if submitted to this treatment it could be used as the principal ore. If, for instance, 40 per cent of it were submitted to sintering, the sulphur content could be reduced to, say, 0.28 per cent. The surcharge of 2 pesetas per ton incurred by this treatment is balanced by the reduction in sulphur content and of flue losses.

The production of rubio has been steadily decreasing since 1899; the mines are becoming steadily poorer in this class of ore, and very few have maintained their reserves intact. In the production of rubio, labor costs amount to 40 per cent of the total, but this item could be reduced by mechanical methods of loading and improving transport in big mines. Spathic mines can be mechanized under better conditions than rubio, as the ore is clean, almost free from waste, and the majority of mines have considerable quantities of this ore.

Some interesting facts were given by the author regarding the conditions of iron ore mining in Spain. Under the law of the country, the state grants a concession of mining rights to any person who applies for it, without the necessity of consulting the owner of the surface or proving the existence of the mineral. The minimum unit of surface area for which mining rights can be granted is 4 pertenencias (a pertenencia is a rectangle of 100 m. square, i.e., 1 hectare), and the royalty to be paid, which varies according to the class of minerals to be mined, is 6 pesetas per pertenencia for iron ore.

The concession of a mine only becomes void through non-payment of the surface royalty, and the mine itself may be left unexploited as long as the concessionaire desires. Due to the insignificance of the royalty paid and to the exploitation of the mine not being enforced within a fixed number of years, many mines containing large quantities of minerals are left unworked. As a general rule the mines are not worked by the owners, but are leased at a certain royalty per ton on a minimum output per annum. The lessee on his part usually employs a contractor who extracts the mineral and puts it into storage.

The royalty paid by the lessee to the owner varies according to the class of mineral. It oscillates between 0.50 peseta

(in very old contracts) and 6 pesetas in some; the average is about 2 pesetas per ton.

Contracts are usually of two classes. In big companies like the Orconera, Franco-Belga, and Parcocha to a certain extent, the principal installations, lines, compressors, locomotives, inclines, etc., are the property of the company and are worked under their administration. The contractor has a contract for one year, placing the output near the main-line railroad and into stock, all charges in connection with raising the ore, loading, and unloading being on his account. In this type of contract a fixed sum is usually paid for each product extracted, be it mineral or overburden.

Usually contracts are given at a fixed price per ton of rubio, spathic, or washed ore placed in stock or loaded into railroad cars. In this case the contractor is liable for all risks. He buys the machinery, and erects inclines, tracks, etc. The price varies from 8 pesetas to 10 pesetas per ton for rubio and 10 pesetas to 12 pesetas for calcined spathic. The lessee pays all charges for transport and general administration, royalties to the owners, etc. For every workman employed in the mines the law enforces the payment of 12 centimos (about 1¼d.) per day toward the workmen's pension fund, and the payments for accidents are about 4 per cent of the daily wage.

Transverse Test for Cast Iron

J. G. Pearce, director British Cast Iron Research Association, suggested that the true criterion of transverse strength is the modulus of rupture determined for the actual bar section, measured at the point of fracture. By concentration on the new standard cylindrical transverse bar test, and by casting bars of varied sizes and compositions, it becomes possible to chart relations between size and strength and between composition and strength. The author showed that the transverse rupture modulus increases continuously as the test bar diameter diminishes until the point is reached at which the metal ceases to be gray. The size-strength curve is a useful index to the behavior of cast iron in thick sections, and the composition-strength curve deduced from a series of these promises to be of considerable assistance both to the designer of cast-iron structures and to the founder who has to realize the designer's ideas. The transverse strength is closely related to tensile and compressive strengths, but this relationship is only shown if the transverse strength is expressed as rupture modulus, based on the area at fracture.

Corrosion of Iron and Steel

In their paper on the phenomena of corrosion of iron and steel, A. Herrero and M. de Zubiria of Bilbao studied the problem of corrosion due to atmospheric agency alone. They referred to the serious depletion of our fuel reserves resulting from failure to attack this evil at its source. On this point the authors assumed a world's annual production of 100,000,000 tons and an average life of iron and steel products of 30 years. With a consumption of four to five tons of coal or its equivalent per ton of steel, from the getting of the ore to the finished product, the loss is obvious. The problem is acute in Spain, where atmospheric conditions appear singularly productive of corrosion, but emphasis was laid on the point that raising the price of ordinary commercial steels above that at which they must of necessity be sold would not provide an economic solution of the question. The causes producing corrosion were described as of two distinct types: (1) those which are independent of the object which suffers corrosion, and (2) those which are a function of the physical or chemical properties of the object. In the first category faulty design was mentioned as an important cause of corrosion. The miscalculation of certain principal parts of a steel structure has resulted in the material being stressed in parts beyond its

elastic limit. Under such conditions the parts so stressed are highly liable to corrode even though the remainder may remain normal, and thus the stability of the entire structure may be impaired.

It has also happened in the case of a structure perfectly designed from the point of view of resistance to the mechanical stresses that rain water may accumulate in hollow spots and remain a long time without draining off, and if such spots are not easily accessible it may not be easy to keep them properly painted or remove any coating of rust which may have formed on the steel structure. All such cases show the importance of the study of corrosion from the point of view of safety, and how the rusting of a small and insignificant part may lead to the destruction of the whole structure.

Concerning the general atmospheric conditions, it is evident that a moist air and persistent exposure to rain with strong aeration are agents which particularly favor corrosion, since both the electrolyte and influence of oxygen then come into action. If to these conditions be added that of proximity to the sea, bringing with it air laden with sodium chloride, which increases the conductivity of the electrolyte and consequently accelerates the corrosion, it will be readily understood that the metallurgical works of Vizcaya are unfortunately exposed to a combination of all the circumstances most apt to produce intensive corrosion due to external causes.

With regard to the internal causes which stimulate corrosion the authors advocated proper heat treatment and mechanical treatment, the elimination of impurities and avoidance of segregations, as the principal objects to aim at to obtain improvement.

Mechanical Properties of Carbon Steels

Joaquin Orlando of Madrid described experiments to determine the influence of pearlitization below the A_1 point on the mechanical properties of carbon steels. On tempering quenched steel a finely granular pearlite is obtained which gives to the steel both a tensile strength and an impact resistance greater than that given by laminar pearlite in annealed steel. For low carbon steels a temperature of 500 deg. C. appears to be the best. For higher percentages of carbon the temperature of 580 deg. C. has yielded good results.

Steel Bath Conditions

J. H. Whiteley of Consett discussed some of the observations by which a smelter is guided in judging the condition of a bath of steel, and described an investigation which he has carried out. Although much further work is needed, the results so far indicate that the examination of quenched pellets can yield additional information on bath conditions.

Cold-Drawn Heat-Treated Steel Wire

An examination of the properties of cold-drawn chromium-vanadium steel wire described by S. H. Rees of the research department at Woolwich shows that conclusions previously arrived at in connection with carbon steel wire are applicable when suitable modifications of the quantitative data have been made. Thus, complete restoration of elasticity at atmospheric temperature requires treatment at 300 deg. C. instead of 200 deg. C., and other changes which occur on low temperature heat treatment are comparable in extent when the chromium-vanadium wire has been heated at a temperature about 100 deg. C. higher than that applied to the carbon steel wire. In its behavior under stress at raised temperatures, the superiority of cold-drawn chromium-vanadium steel treated for 1 hr. at 400 deg. C. over the most suitably treated cold-drawn carbon steel wire (1 hr. at 300 deg. C.), and over the same steels hardened and tempered, is considerable.

Steel Treathers Meet in Philadelphia

Large Conclave of Metallurgists Discusses Progress in Stainless Iron, Tool and Alloy Steels, and Heat Treatment

—British Metallurgist's Lecture a Feature

MEETING in the city and hall where it held its second annual convention and exhibition in 1920, the American Society for Steel Treating last week, Oct. 8 to 12, celebrated its tenth annual gathering at Philadelphia. Those who were present at both conventions could not fail to be impressed with the remarkable strides which have been made in heat treatment both technically and in equipment as reflected in the exhibits.

Augmented by simultaneous conventions of the Institute of Metals and of the American Welding Society, National Metal Week again brought together groups of men whose interests interlace in varying degrees in the fields of pure science, practical metallurgy and work-a-day shop procedure.

A feature of the week was the Campbell memorial lecture by Dr. W. H. Hatfield, noted British metallurgist, which was listened to by about 550, a record for such gatherings.

The National Metal Exposition, while not so large as those of 1927 in Detroit and of 1926 in Chicago, was a marked success. Its compactness and attractiveness were commented upon, and exhibitors generally were optimistic as to the results and concede it one of the best in years.

Offering nearly 40 papers at 10 sessions the technical program was up to a high standard. Only a few of the important ones can be reviewed here. They all illustrated the progress being made in various fields of heat treatment.

Wide Interest in Stainless Irons

IT is evident that there is keen interest in the stainless irons and steels. One largely attended session was devoted entirely to these alloys. Four papers covered several developments, new steels and new applications were introduced to the assemblage and the meeting was one of the most instructive of the week.

The four papers were: "A New Development in Corrosion-Resisting Steel," by Frank R. Palmer, Carpenter Steel Co., Reading, Pa.; "Stainless Iron and Its Application to the Manufacture and Transportation of Nitric Acid," by Dr. Walter M. Mitchell, Central Alloy Steel Corporation, Massillon, Ohio; "Chromium-Copper Steels As Possible Corrosion-Resisting Ferrous Alloys," by Dr. B. D. Saklatwalla and A. W. Demmler, Vanadium Corporation of America, Bridgeville, Pa., and "An Investigation of the Physical Properties of Certain Chromium-Aluminum Steels," by Frank B. Lounsberry and Walter R. Breeler, Atlas Steel Corporation, Dunkirk, N. Y.

Zirconium Sulphide Solves a Machining Problem

A novel application of zirconium sulphide was announced as solving a difficult problem. In the machining and grinding of some of the high-chromium steels, trouble has been experienced, said Mr. Palmer, in his paper; the chips often adhere to the cutting tool, with similar difficulties in grinding. A solution of the problem is claimed to have been found.

Taking as a basis the known effect of fairly high percentages of sulphur and phosphorus on the machinability of certain steels, it was ascertained that the presence of 0.40 per cent of zirconium sulphide in the chromium alloys had the same effect on the machinability and the grinding properties as 0.30 per cent sulphur. The alloy steels, however, are easily worked with the presence of the zirconium sulphide, whereas they can not be with a high-sulphur content. Thus by introducing the sulphide of zirconium, the machining and grinding properties of rustless iron are greatly improved.

The author also announced that the presence of this

sulphide does not impair the resistance to corrosion nor to scaling at high temperatures and that the alloys can be forged or rolled under 2100 deg. Fahr. The sulphide does, however, decrease ductility and lowers the Izod value. Microscopically it does not dissolve in the ferrite, but is distributed as nuclei.

In the discussion it was brought out that stainless irons containing the zirconium sulphide can easily be cold drawn, but that its application to stainless steels had not yet been fully worked out, though it seems to have the same effect. An answer to questions as to how this sulphide is introduced was not forthcoming.

Dr. W. H. Hatfield of Sheffield, England, the Howe memorial lecturer this year, testified that some workers in England experienced the difficulties in machining and grinding referred to by Mr. Palmer, while others did not; that the alloys were not difficult to handle in their properly heat-treated condition. He made a plea for standardized corrosion tests as between British and American workers in this field so that there could be a common basis for judging results.

Rustless Iron in Nitric Acid Plants

One company is using, or has under contract, 1200 tons of stainless iron involving an investment of \$1,500,000 for equipment to make nitric acid by the fixation of nitrogen process, said Dr. Mitchell, in introducing his paper. Stainless irons have been found particularly resistant to nitric acid and the author discussed the requirement for the construction of equipment for the manufacture and transportation of the acid. He also critically examined the existing specifications for stainless iron for this purpose, dealing especially with plates, rivets, tubing, castings, tank cars, shipping drums, etc.

Making Cheaper Rustless Steels

In an attempt to develop a cheaper alloy than the regular stainless iron, Dr. Saklatwalla and Mr. Demmler, in their paper, offer a chromium-copper steel. They say a

low chromium (0.50 to 3.00 per cent) steel containing about 0.50 per cent copper is capable of being produced in open-hearth furnaces at a low cost. They point to it as occupying a position between the stainless irons and the plain

copper-bearing steels or ingot irons and as having superior rust-resisting properties, capable of being made at the cost of ordinary open-hearth steel plus the expense of the chromium and copper.

A Session Devoted to Steel Making

WHEN the session on steel melting was made a regular part of the program three years ago, it was the general impression that it was to be of a practical educational nature for the immediate benefit of steel treaters. This policy has been consistently carried out until this year. It is doubtful that anything is to be gained under the conditions suggested by the presentation of papers of the character of some of those last week. Two of the four papers at the session were of such a highly technical and mathematical nature as to be beyond the comprehension of all but a few specialists present. Commendable and excellent as these were, they belonged to an entirely different group or society meeting.

Steel Best Suited to Large Ingots

That acid open-hearth heats are best suited to the manufacture of larger ingots for heavy forgings was advanced by H. P. Rassbach, Midvale Steel Co., Philadelphia, in a paper, "Manufacture of Open-Hearth Steel for Forging Ingots." When ingots up to 400,000 and 500,000 lb. are to be made, there is less uncertainty regarding the success of transverse tension tests if acid steel is used. This grade is less complicated, said the author, than basic open-hearth and better results are obtained.

Mr. Rassbach described in some detail the practice of the Midvale company in making and pouring these large ingots of various sizes and shapes from 50 to 70-ton oil-fired furnaces.

How Silicon Deoxidizes Steel

Another chapter in the excellent work which Dr. C. H. Herty, Jr., and his associates at the Bureau of Mines Station at Pittsburgh are doing was embodied in a paper, "Deoxidation of Steel with Silicon," which he, with his coauthor, G. R. Fitterer, presented last week. Much of the paper had a theoretical basis and so had its discussion. The writing of the paper resulted from an investigation as to how silicon

deoxidizes steel and how far it goes under certain conditions.

The mechanism of the deoxidation with silicon is, first, the formation of silica by the reversible equation: $\text{Si} + 2 \text{FeO} = \text{SiO}_2 + 2 \text{Fe}$, and, second, a fluxing of more oxide of iron by the silica, forming a ferrous silicate inclusion. Complete deoxidation of steel is impossible unless the oxide formed is absolutely infusible and insoluble at steel-making temperatures. It may also be concluded, say the authors, that silicates high in iron or manganese will be more readily eliminated from the bath than high-silica particles, due to their lower melting point, with consequent increased rate of coalescence.

Commenting on this and other papers, Dr. W. H. Hatfield, Sheffield, England, paid a tribute to Dr. Herty by declaring that his investigations are being eagerly watched in England, particularly by the steel ingot committee of the Iron and Steel Institute, of which committee Dr. Hatfield is chairman. He offered the opinion that if steel is properly refined, its oxygen content will be very low and it will be free from inclusions; and to achieve that the electric furnace is best adapted.

Two other papers presented at this session were "The Equation of the Carbon-Time Curve in Open-Hearth Refining and Prediction of Carbon Drop," by Alexander L. Feild, Union Carbide & Carbon Corporation, New York, and "A Melting Record of Three Acid Open-Hearth Heats," by W. E. Griffiths, research metallurgist Union Carbide & Carbon Research Laboratories, Long Island City, N. Y., and C. E. Meissner, development engineer Chrome Steel Works, Carteret, N. J. Mr. Feild's paper contains a general survey of the physico-chemical relations obtaining during basic open-hearth refining and discusses the significance of the general differential equation involving the various factors. The other paper presents a complete log of three acid-open hearth heats so as to show the effect of adding silicon in the ladle rather than in the furnace.

Hardening Steel With Nitrogen

A SERIES of papers on aluminum steels and the nitride case-hardening process caused much discussion at one session. It is plain to see that the characteristics of the hardened surface and the economics of the process are being given much consideration by metallurgists and production men.

Raymond H. Hobrock of the Engineering Experiment Station, Purdue University, Lafayette, Ind., in a paper, "Surface Hardening of Special Steels with Ammonia Gas Under Pressure," finds that it is possible to reduce the nitriding time by one-half by conducting the operation at a pressure of 600 mm. of mercury above the atmosphere. In order to get a scleroscope hardness of 90 on the very surface, 30 hr. is required, regardless of the pressure. But increasing the pressure drives the case deeper (as shown in Fig. 8) and also produces uniform hardness of about 75 scleroscope for a considerable depth just under the skin. Theoretical considerations indicate that the latter represents the optimum hardness attainable by aluminum nitride; the extra skin hardness is thought to be due to some iron nitride existing there. It is also concluded that hardest surfaces of shallow depth may be made in high-aluminum

steel, but that if penetration is also desired, the amount of aluminum in solid solution must be closely controlled.

Many persons in the audience criticized Mr. Hobrock's use of the scleroscope for hardness measurements. G. M.

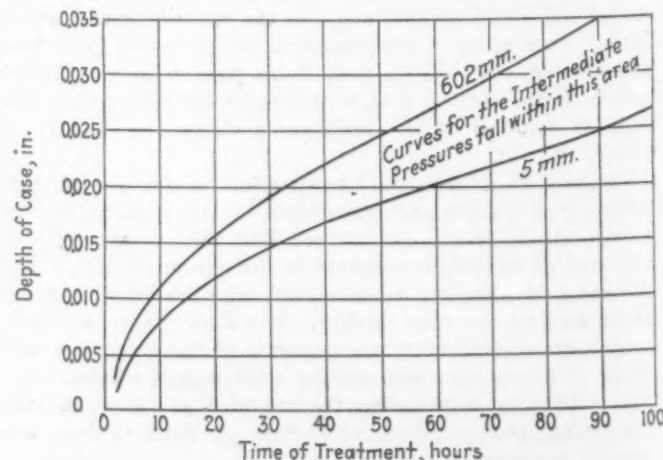


Fig. 8—Relation Between Case Depth and Time

Authors of Technical Papers Read at Philadelphia



F. R. PALMER



W. M. MITCHELL



C. H. HERTY, JR.



A. B. KINZEL



S. L. HOYT

Eaton, Molybdenum Corporation of America, believes that the Vickers diamond indenter (*THE IRON AGE*, March 1, 1928) is the best instrument for this purpose. It also can separate tough surfaces, which in practice withstand wear excellently, from unsatisfactory brittle cases. The impressions in steels of the former class are surrounded by ridges of plastically deformed metal, appearing much like the depressions made when testing mild steel, whereas brittle surfaces of no greater hardness will flake badly at the edge of the indentation.

Methods of test for nitrided surfaces, in the opinion of several speakers, should be correlated with wear resisting ability, since the parts so treated are ordinarily used in such service. Consequently a wear testing machine is badly needed. It was suggested that this might use the principle of drawing a soft iron wire across the hardened surface, it being well known that this is one of the most severe cutting actions occurring in manufacturing operations. That nitrided cases actually do resist wear is vividly shown by Guillet's experiment of running two aircraft engines for 100 hr. on a test block. One had nitrided piston rings and

cylinder bores. The other was of regular construction. The former was consuming oil at the same rate at the end as at the beginning, while the latter's oil consumption rate tripled.

Crystalline structure of the untreated steel is also an important factor in the success of nitriding. V. T. Malcolm, Chapman Valve Mfg. Co., Indian Orchard, Mass., said that the nitrided cases now being used by them on gear teeth are giving much superior service. The improvement is understood to come from better control and understanding of the process. This led to the inquiry as to whether aluminum oxide in the steel is not a controlling factor, but Prof. V. O. Homerberg, Massachusetts Institute of Technology, Cambridge, Mass., said that very few inclusions are visible under the microscope, and that impact strengths are satisfactory; consequently he concludes that the aluminum exists as metal. He emphasized that at least 30 per cent of the ammonia in the reaction chamber must be disassociated in order to prevent decarburization of the surface by the free hydrogen; in his opinion, lower carbon surfaces usually are brittle and unsatisfactory in service.

Two Methods of Heat Treating High-Speed Steel

HHEATING high-speed steel in a molten salt, or in molten lead, to a temperature of 2400 deg. Fahr. was shown to be feasible, in two papers read at one session. One of these, "A New Method for Heat Treating High-Speed Steel," was by Horace C. Knerr, 538 Washington Lane, Germantown, Philadelphia, who is consulting metallurgical engineer to Ajax Electrothermic Corporation, Summerill Tubing Co., and others. The other was read by Wilbur C. Searle, who is associated with the Leland-Gifford Co., Worcester, Mass. It was entitled "Heating High-Speed Steel to 2400 Deg. Fahr. in Molten Lead."

Heat Treating High-Speed Steel

FEATURES of the method described include electrical heating, close temperature control, which may be made automatic, the use of a salt bath which does not give off fumes or attack the tools, prolonged container life, absence of furnace deterioration, comfortable working conditions, low heating cost per pound of steel, and the ability to employ full hardening temperatures (in the neighborhood of 2400 deg. Fahr.) without injury to finished surfaces or cutting edges of high-speed steel tools.

Heating the container for a salt bath required to operate at temperatures of about 2400 deg. Fahr. for continuous periods has heretofore involved serious difficulties, including:

- (a) Attack of the container by the salt bath, or by decomposition products of the bath.
- (b) Attack of the container by products of combustion, or by the furnace atmosphere, when electric heat was used.
- (c) Rapid deterioration of furnace parts and lining, including the resistors when electrically heated.
- (d) Low fuel efficiency, owing to high sensible heat in the escaping products of combustion when burning gas or oil.
- (e) Difficulty of securing accurate temperature control.
- (f) Unpleasant working conditions, due to fumes, gases and heat, etc.

A new liquid bath has been developed which shows excellent characteristics at temperatures as high as 2450 deg. Fahr. The mixture is rather viscous just above its melting point, but at temperatures above 2250 deg. Fahr. it is sufficiently fluid to permit strong convection currents to be set up, which assure temperature uniformity within the container. Even at the highest temperatures (2450

deg.), a film of molten salt adheres to the piece of steel when removed, protecting its surface from the atmosphere during transfer to the quenching medium.

When uncontaminated from outside sources, the molten salt is neutral to steel, neither visibly attacking its surface nor causing serious carburization or decarburization. There are no fumes and its cost is moderate. Patent considerations prevent disclosing the composition at this time.

What Has Been Done in Service

Finished tools of various types have been heat treated at 2350 to 2400 deg. Fahr. without any mark upon the surface other than a slight discoloration. Sharp cutting edges were practically unaffected and retained file hardness. No pitting, scale or other surface defects occurred when the treatment was properly carried out. There was no warping, provided, of course, internal strains had been removed from the tools before treatment. These tools were quenched in oil and tempered either in a salt bath or an electric muffle furnace at 1100 deg. Fahr. for from 1 to 4 hr. Rockwell hardness of 62 to 65 C was obtained on the surface after tempering.

Drills, thread cutters, files, file cutting chisels and lathe tools treated by this method have been tested in service. Results compared favorably with tools treated in the open furnace and ground, and were superior to tools treated in salt baths at the customary lower temperatures.

Heating High-Speed Steel in Molten Lead

THIS paper describes the apparatus and method of heating high-speed steel to 2300 to 2400 deg. Fahr. in molten lead. Photomicrographs show the structure obtained in specimens at 2200, 2300 and 2400 deg. The method has been used for a number of years by at least two concerns in Worcester.

Work being hardened includes small and large pieces; any pieces that will go into the crucible can be hardened. Flat cutters, circular formed cutters, reamers, etc., are all hardened successfully by this method. It is possible to harden part of a flat cutter and have part not hard; also the cutting portion of a reamer can be hardened and the shank left soft.

How This Method Is Applied

Preheating is done usually in an electric oven furnace equipped with an automatic control. The control is set for 1600 deg. Fahr. A gas furnace is used for heating the lead, which is contained in a graphite crucible. Ordinary city gas, 530 B.t.u., is used. The time to bring the bath up to 2300 to 2350 deg. is 2½ to 3 hr. About 900 cu. ft. of gas is used, and about 200 cu. ft. an hour thereafter.

High-Chromium Additions in Making Steels

ADDITIONS of considerable chromium to high-carbon steels for dies and kindred uses were described in one paper read at the meeting. The steels here discussed had from 1.38 to 2.38 per cent of carbon and from 12.01 to 16.95 per cent of chromium. Another paper took up the addition of chromium to silicon-manganese steels as an aid to obtaining high physical properties in oil-quenching, which, for various reasons, is preferred in manufacturing practice to quenching in water. Abstracts of these two papers, and of the discussion which they elicited, follow.

Silicon-Manganese Steels With Chromium Additions

EXPERIMENTS in developing a type of steel not now used, for automotive and other similar use, were described by A. B. Kinzel, Union Carbide & Carbon Research Laboratories, Long Island City, N. Y. His paper, "Silicon-

Pieces taken from the preheating furnace one at a time in a pair of tongs are held in the molten lead for a definite number of seconds, depending on the size of the piece. The ends of the tongs are just above the lead surface. The piece is removed at the end of the immersion period and dropped into a basket in the quenching oil. At the end of the heat the pieces are removed from the quench, washed in hot washing compound and placed in the electric furnace for tempering at 1050 to 1100 deg. Fahr.

Other Methods of Attaining High Temperature

In presenting his paper, Mr. Knerr prefaced his remarks with the statement that, through THE IRON AGE, he had learned that about 15,000 tons of high-speed steel is produced, sold and used annually in the United States.

Prof. W. Trinks, who presided at this meeting, read a communication stating that a method somewhat similar to that proposed by Mr. Knerr had been used elsewhere, in which two special salts were utilized, the second one being solvent in the first and used in quenching and drawing the material at 1100 deg. Fahr. The writer stated that he had been able to heat the first salt to 2250 deg. in 18 min. while using 19 kw. of electric power.

Another speaker told of another method for achieving the same result. He uses electric heat with close temperature control, the salt bath, and gets away from fumes and other troubles experienced from the use of combustible fuels. This method was developed in 1920 by A. E. Bellis, his salt being used in oil and gas furnaces. The electric furnace has now superseded the others, but for certain reasons the composition of the bath could not be given.

This salt is fluid enough above 1800 deg. Fahr. to assure a setting up of convection currents and thus produce circulation. Even when the temperature is as high as 2500 deg., a certain protective coating of the salt adheres to the steel when removed, and keeps it from oxidizing while being transferred to the quenching medium.

This method makes use of a heavy electrode. As there is no direct heating of the pot itself, the pot has an almost indefinite life. The early electrodes used for this process wore away rapidly, but a new type has been developed which gives evidence of being able to last indefinitely. The pot used is 8 in. in diameter and in many cases the liquid depth is about 11 in. There is a very thick heat insulation surrounding the whole apparatus. This was shown in two lantern slides, one of which showed a single pot, while the other showed three pots, all in the same surrounding insulating medium. Over 90 per cent of the total electric input was developed as actual heat in the electrode.

Manganese Steels with Chromium Additions, for Engineering Applications," is briefly abstracted below:

For silicon-carbon steels the practical working carbon limits have been found to be about 0.20 to 0.40 per cent. Manganese, however, may vary with the silicon. Two 1-in. round specimens of the same analysis, each with 1 per cent silicon, were quenched from the same temperature, the one in water, the other in oil. Their resultant physical properties were as follows:

	Quenched in Oil	Quenched in Water
Yield point (a)	89,000	122,000
Ultimate strength (a)	115,000	135,000
Elongation, per cent.	20	20
Reduction of area, per cent.	54	58

(a) Pounds to the square inch.

This superiority in the water-quenched material appears to be typical of this type of steel. An effort was made to

produce a steel which would, on oil quenching, provide qualities equivalent to those here shown for water quenching. Such a steel was made with 1 per cent chromium, 1 per cent manganese, 1 per cent silicon and 0.30 per cent carbon, which gave about the same results, whether quenched in oil or in water. Three samples of this steel, A, B and C, gave results as follows, compared with other steels:

	Yield Point (a)	Ultimate Strength (a)	Elongation, Per Cent	Reduction of Area, Per Cent
A	136,000	151,000	18	50
B	175,000	201,000	10	42
C	151,000	167,000	12	48
D	128,000	152,000	12	52
E	125,000	150,000	15	57
F	142,000	167,000	20	53

(a) Pounds to the square inch; D, S.A.E. No. 2330, 3½ per cent nickel; E, S.A.E. No. 3130, chrome-nickel; F, S.A.E. No. 6145.

From these comparative data it is seen that the steel now proposed for use in automotive and kindred parts is of the same order of excellent utility as those now in general use for such purposes, and is superior in some qualities, notably strength. Plain manganese steels, however, without the silicon addition, fall short of such properties. This work was carried out at first on 6-lb. ingots. Later the studies were made on heats from a 300-lb. electric furnace.

It follows that a medium carbon (around 0.35 per cent) silico-manganese steel is available whose physical properties make it suitable for use in engineering work and it is susceptible to easy heat treatment. Its properties are on the same order as those of the best alloy steels, heat treated.

Probably the best result from Mr. Kinzel's paper, in the opinion of Allen L. Davis, Scovill Mfg. Co., Bristol, Conn., lies in his introducing to users the product with which he has been experimenting. It is not a new steel, for such analyses were made 15 years ago. But it has not become known, and it may well be added to the list of steels at command of the engineer.

High-Carbon High-Chromium Steels

CERTAIN physical characteristics of high-carbon, high-chromium steels were discussed in a paper by James P. Gill, chief metallurgist Vanadium Alloys Steel Co., Latrobe,

Pa. The author compares the properties of six steels of the high-carbon, high-chromium class, which, during recent years, have become so popular as die steels. The comparison covers the critical points, hardening and tempering curves, microstructure and physical properties. A short discussion of the constitution of steels of this class is included; also a brief historical outline of the development of steels of this type.

Suitable for Many Tools

Such qualities as high resistance to wear, nondeformation on hardening and ability to harden in oil or air, adapt this steel to a wide variety of tools and dies. Possible applications are almost unlimited; a few of the uses for which it is especially suited are as follows: blanking dies, drawing dies, coining dies, forming dies, thread rolling dies, trimming dies, shear blades, punches, lathe centers, gages, bushings, certain types of cold-heading dies, rolls for cold forming, seaming rolls, wear plates, brick mold liners, cutting tools for brass and bronze, guides, mandrels, etc.

In the table is given the chemical composition of the six steels studied:

CHEMICAL COMPOSITION OF STEELS STUDIED
Per Cent

Steel	C	Si	Mn	S	P	Cr	V	Co	Ni	Mo
A	2.38	0.42	0.71	0.010	0.030	12.48	0.00	0.00	0.24	0.00
B	2.12	0.24	0.31	0.020	0.021	13.20	0.81	0.00	0.12	0.00
C	1.38	0.35	0.26	0.006	0.015	12.20	0.00	3.45	0.00	0.54
D	2.17	0.19	0.46	0.009	0.015	13.43	0.00	0.00	0.51	0.00
E	1.60	0.09	0.30	0.011	0.026	16.95	0.00	0.00	0.31	0.00
H	2.19	0.24	0.39	0.012	0.018	12.01	0.72	0.66	0.00	0.00

Difficulty in machining material of this character was stressed by H. J. Keshian, metallurgist Chase Companies, Waterbury, Conn., in discussing Mr. Gill's paper. The machining properties are even more difficult than with high-speed steel. The same difficulty is experienced when it is attempted to grind this material. As a result, special types of grinding wheels are necessary in handling it.

It was found experimentally that lowering of the carbon to 1 or 1½ per cent does not assist much in this problem of machining or grinding. Taking up this phase of the subject, Mr. Gill reported having found that, when such material is at a Brinell hardness of 196, it machines appreciably easier than at 250. All chromium steels have the property of machining in a "gummy" manner. That is, there is a piling up of material on the cutting edge of the tool, thus interfering with its free action.

Various Important Topics Covered by Single Papers

WHILE some of the sessions were so developed as to cover mainly some major topic, with a number of papers on different phases of that topic, there were other sessions at which the papers had little or no relation to each other. A group of such papers, read at several sessions, has been abstracted in the following pages.

On Oxygen Dissolved in Steel

ILLUSTRATING his paper with a number of lantern slides, Marcus A. Grossmann, metallurgical engineer Central Alloy Steel Corporation, Canton, Ohio, discussed the subject of "Oxygen Dissolved in Steel, and Its Influence on the Structure." An abstract of his paper follows:

It is shown that in regular pack carburizing (box carburizing), steel absorbs not only carbon but also oxygen, which diffuses into the steel. This was determined by analyzing strictly comparable samples for oxygen, one sample before carburizing and the comparative sample after carburizing. The oxygen determinations were made by the vacuum fusion method, in a graphite crucible.

The amount of soluble oxygen present in steel appears to affect the microstructure. (The soluble oxygen diffuses readily, and is considered here apart from precipitated oxides and nonmetallic inclusions.) A high oxygen content seemingly favors solubility of cementite in alpha iron, and as a result of this solubility it affords opportunity for cementite to diffuse. This theory, advanced by P. D. Merica in a consideration of these data, is supported by all evidence which is at present available.

In certain steels, cementite may occur not as pearlite but as massive cementite associated with grains of ferrite. The separation of pearlite into massive cementite and ferrite appears to be due to diffusion.

Cementite diffusion (and hence agglomeration) seemingly accounts for the phenomenon of "split cementite" in the structures observed in a McQuaid-Ehn test, and also for the structure of "boundary cementite" in low-carbon steels. These structures are characteristic of high-oxygen material. McQuaid-Ehn phenomena should be examined in

the light of original oxygen in the steel plus oxygen absorbed in carburizing.

Solubility of cementite in alpha iron can be indicated on the iron-carbon diagram. Since some steels exhibit

Fig. 11 (Left)—Iron-Carbon Diagram Indicating Some Solubility of Cementite in Alpha Iron

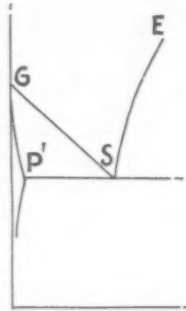
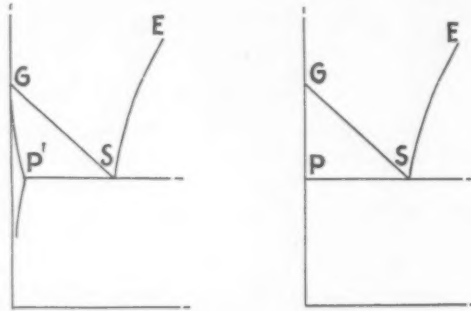


Fig. 12—"Ordinary" Iron-Carbon Diagram. Cementite Insoluble in Alpha Iron



cementite diffusion while others do not, it is suggested that different iron-carbon diagrams can be drawn for different steels, varying the diagram to accord with the cementite solubility and hence with the diffusion power. Oxygen contents must apparently be considered, and in carburized steels it is the oxygen content after carburizing that is significant.

If the solubility of cementite in alpha iron varies for different steels, these variations can be indicated by changes in the iron-carbon diagrams which represent those different steels.

In discussing this paper one speaker reported having tried to check the results obtained, without finding any definite effect from the treatment. In one case—that of ingot iron—he found an actual decrease, from 0.049 per cent to 0.037 per cent of oxygen, after carburizing the specimen for 36 hr.

Dr. H. W. Gillett, United States Bureau of Standards, made particular reference to the iron-carbon diagram as the "foundation stone of all our knowledge of heat treatment." In a study extended over 10 years or more the bureau has collected a mass of data. He pointed out that in deoxidized material, especially that of about ¼ per cent Mn, the P point comes nearer to the left of the diagram than when in the presence of dissolved iron oxide.

Electric Furnaces for Heat Treating

DEVELOPMENT of electric furnaces was briefly reviewed and their advantages for heat treating was pointed out in a paper, "Progress Made in the Use of Electric Furnaces for Heat Treating." The author, Albert N. Otis, is associated with the industrial heating and welding engineering department, General Electric Co., Schenectady, N. Y. The object of the paper was to show the present status of electric furnaces, the extent of their use for heat treating, and some new types which have been developed recently.

Rapid increase in the use of electric furnaces is shown by a list of the principal installations, describing briefly some of the individual furnaces and their operation. Photographs are shown to illustrate the various types. Reference is made to specific applications, including furnaces for annealing tool steel bars and rods, and elevator furnaces for annealing sheet steel for electrical machines, the latter without the use of boxes. Large savings are shown by this method.

Among new developments, electric furnaces for forging are referred to, also continuous furnaces for the new process of copper brazing, and for annealing in atmospheres of protecting gas.

Greater Production at Lower Cost

There is no doubt that the development of electric heating has been a valuable contribution to the manufac-

turing industries. They are an aid in improving quality, reducing cost, providing better working conditions and enabling output per man to be increased. This art is relatively new, and appears to have vast possibilities for the future.

In response to several questions from the floor, Mr. Otis stated that the annealing boxes ordinarily used in heat-treating in electric furnaces are made customarily of steel plates. The Ludlum Steel Co., however, has been using alloy steel boxes for the past three years without losing any boxes, and an examination of them shows that they probably have many more years of usefulness ahead.

In comparing costs of electric heat treating against heat-treating using oil as fuel, the unit prices were 1¼c. for each kwhr. in the electric furnace and 5¼c. a gallon for oil.

Steel Failures in Aircraft

THIS paper discusses failures in steel aircraft parts which have been investigated by the metallurgical laboratory at Wright Field. The author, F. T. Sisco, is chief of the metallurgical laboratory, Air Corps, Wright Field, Dayton, Ohio. The methods used in the investigation of these failures are described briefly, followed by a classification of the various failures in respect to their origin.

Included in this classification is an account, illustrated by typical and representative cases, of: (1) failures due to faulty manufacturing methods and not caused by defective material; (2) failures due to internal defects, such as non-metallic inclusions; (3) failures due to seams and other surface defects; (4) miscellaneous failures due to defective steel, including large grain size, segregation and banding; (5) failures due to faulty or wrong heat treatment; and (6) failures due to welding.

Failures of material on aircraft in service are comparatively rare; probably 90 per cent of them occur during test. From the large number of failures investigated in the past five years, it has been possible to classify them, to form rather well defined opinions concerning their causes, and to make recommendations to reduce their number.

Some Causes of Metal Failure

It has been established without doubt that a concentration of stress occurs at sharp corners, keyways, screw threads, toolmarks, gear teeth and the like and leads to early fatigue failure. There has been some question as to whether non-metallic inclusions accelerate failure by fatigue. The results brought out by Lucas in his study of the path of fatigue failure, and by Styre in his discussion of Lucas' paper, show conclusively that fatigue cracks frequently have their origin in clusters of slag particles.

Several engine builders were troubled by an excessive number of valve spring failures. These springs were made out of a chromium-vanadium spring wire by experienced spring makers. The stresses on a valve spring can be estimated with a fair degree of accuracy. In one engine this stress varied from about 30,000 to 50,000 lb. to the sq. in. So far as is known the torsional endurance limit for spring tempered chromium-vanadium steel has not been determined, but past experience has set 30,000 to 50,000 lb. as a safe working stress for these springs.

When an excessive number of failures developed, the springs were increased in size so that the stress range was decreased to about 20,000 to 35,000 lb. to the sq. in. Even with this greater margin of safety the number of failures did not diminish noticeably.

Investigation disclosed that the steel in the springs was not of high quality. The detection of slag inclusions and other defects led to the conclusion that the failures were due to defective steel. After a search for a source of supply of high-grade steel, high-carbon piano wire was used for valve springs. With the introduction of these springs the stress range was increased to 35,000 to 50,000 lb. to the sq. in. and

the springs were placed in service. Failures of these springs are almost unknown.

Fatigue Failures Caused by Overloading

Practically all crankshaft failures are due to fatigue; most of them have their origin either in a fillet or in an oil hole. There is little doubt that the direct cause of failure is a highly concentrated stress at the point where failure starts. That this failure is due to overloading is probable. There is no direct evidence that hairline cracks, small seams or other defects cause the failure, but there is considerable basis for the assumption that they contribute materially.

The art of welding, especially of thin tubular products, has progressed to the point where it is practically 100 per cent perfect. The perfection attained is so high that at

now overcome these failures practically completely, by re-designing end fittings which attach the stream-line wire to the structure.

Tungsten Carbide—A New Tool Material

DEVELOPMENT of a material for use as the cutting edge of tools subjected to hard service and heavy duty was reported by Samuel L. Hoyt of the research laboratories of the General Electric Co., Schenectady, N. Y. Tools of this material, which has been much studied in Germany, were shown in operation at the Exposition. An abstract of Mr. Hoyt's paper follows:

Use of tungsten carbide as a tool material is described. In tool form it has a Brinell number of over 2000, with half the strength of high-speed steel, and it is capable of

Metallurgists Who Presented Papers at Philadelphia



C. E. MEISSNER



O. W. BOSTON



A. N. OTIS



R. H. HOBROCK



W. E. GRIFFITHS

present the welded fuselage is standard in airplane construction. Other applications of welding in airplane and engine construction are numerous and well known. Failures due to improper welding in the construction of the airplane are exceedingly rare. When they do occur they are almost always due to the welder, and seldom if ever have their origin in the materials or the process.

Improved Steels Have Benefited Others

There are already in existence sufficient types of steels to meet practically all needs which come up in engineering practice, according to Commander William Nelson, United States Navy, in his discussion of Mr. Sisco's paper. The effort should now be put forth to reduce the costs of manufacture of some of these steels and to increase their uniformity and reliability. Hazards in the use of aircraft are certainly high enough now, without introducing further hazards from the use of defective material. The aircraft industry, young and undeveloped as it is, has already caused improvements in materials which are becoming of increasing benefit to other industries.

Attention was called by T. W. Downs to the fallacy of introducing too great a hardness by heat treatment for the particular type of steel used. This has gone in many instances far beyond what the steel is made for, and has resulted in failures, for that reason.

In closing the discussion, Mr. Sisco referred particularly to the question of failures in stream-line wire, brought up in a question from the floor. He stated that these failures have come almost wholly in a series of epidemics, with a large number of failures at a time, followed by study of the causes and correction. The Army aircraft service has

scratching sapphire. Tests on machining quenched high-speed steel, glass, hard porcelain, Hadfield's manganese steel and abrasive compounds are described. On cast iron and steel the carbide tools are shown to be greatly superior to high-speed steel and capable of sustaining cutting at speeds which are several times that commonly used.

Experience gained in production by the General Electric Co. shows that these new tools rapidly attain great industrial importance and that they are indispensable in many lines of work. A number of these applications are described to show the type of performance which has been obtained. In general, the paper gives an account of what is claimed to be the first marked improvement in cutting tools since the introduction of high-speed steel by Taylor and White.

What the Material Will Do

A sample specimen ground to an edge of about 90 deg. is capable of cutting a rather deep, narrow groove in an alundum wheel without suffering much loss itself; whereas ordinary tool materials are worn away by the wheel. This behavior on the alundum wheel gives a good idea of the hardness of the material.

Quenched and tempered high-speed steel has a modulus of rupture in a transverse or cross-bending test of around 425,000 lb. to the sq. in. Similar tests have been run on tungsten carbide tool material at the laboratory, using a section $\frac{1}{4}$ in. square with supports $1\frac{1}{2}$ in. apart. The German material is found to run around 225,000 lb., while our material runs around 250,000 to 275,000 lb. to the sq. in. We have not found it feasible to get a figure for the carbide without cobalt to compare with these figures. It is not likely that a good figure could be obtained, but we may

safely say that the pure carbide would come under 50,000 lb. Our experience indicates that such a material would be very weak.

These figures show that tungsten carbide has had its strength increased by the addition of cobalt to somewhat over half that of high-speed steel. Viewed in one light, this is to be considered as a substantial achievement, but this strength must also be regarded as a factor which places a definite limitation on the use of tungsten carbide in commercial practice.

Toughness an Important Quality

Another important property of a material of this type may be called "toughness"—the ability to stand up under stresses or impacts imposed on relatively small areas. A

Institute of Metals Lecturer



A SCHOLARLY review of the status of chromium and its alloys was delivered by Dr. F. M. Becket, at the dinner of the Institute of Metals. Dr. Becket has latterly devoted himself very largely to research in this field.

weak or fragile material would chip and flake off, but a tough one would stand stresses of this type without injury. This material possesses its share of toughness, since it withstands severe blows of a soft peen delivered on the edge of a bar. The blows are delivered in such a way that the edge would crumble if it were weak. A supporting block of copper shows marked indentations as a result of the blows on the material.

Inasmuch as the break comes abruptly when the bar does break, the material may be called brittle, in that sense. The fracture is of the curved type, while a weaker, or less "tough," material would break straight across.

Durability Between Tool Dressings

We compared tungsten carbide tools with a special alloy cutting tool which had given the best performance on this operation. Three tools were used on this job on two different heads, finishing three faces on the part. The tools of the special alloy required redressing after every 150 parts machined, on the average, when the tools became dull enough to require sharpening. Carbide tools were substituted under the same operating conditions, and finished 11,000 parts before they became dull enough to be redressed.

In the "low-tensile" field the durability of the tungsten carbide tools has been found to be of the order of 25 to 75 times that of high-speed tools. The difference is so great that the simplest kind of a test demonstrates the superiority of the carbide tool. Here the tool pressure is always light, the cuts are small, and the cutting speeds are high. Resistance to either wear or "burning" is the chief requirement of the tool.

One test log is a chromium-nickel steel with a Brinell hardness number of over 250. With a cut of $\frac{3}{8}$ in. and feed of $\frac{1}{8}$ in., good high-speed tools fail at 35 ft. a minute

in about 6 to 8 min. We run the carbide tools with the same cut and feed, but at 70 ft. a minute, and stop the test at 10 min. The tools show only slight wear at that point.

Discussing the paper on "carbology," a representative of the Vanadium Alloys Steel Co., Latrobe, Pa., pointed out that an important element in considering materials of this sort is their atomic concentration, or the specific gravity divided by the atomic weight. For the diamond this is about 0.293, and figures were read for several other materials. For a tungsten carbide it would be 0.160 for WC and 0.127 for W_2C , both of which are much lower than for the diamond.

Service Annealing of Sling and Crane Chains

METHODS of overcoming failures of chain in service were discussed by W. J. Merten, metallurgical engineer with the Westinghouse Electric & Mfg. Co., East Pittsburgh, in a paper, "Service Annealing of Sling and Crane Chains." This paper discusses the inconsistent results in ductility and strength ordinarily obtained when chains are annealed at temperatures unsuited for links that have been severely deformed and cold-worked in service. The author recommends a uniform recrystallization at temperatures considerably above the transformation range, to render the chain entirely safe for further service, without resorting to a reduction of the safety load and basing the calculation of permissible stresses on the average cross sectional dimensions only.

Analysis of the results of experimental and general evidence indicates that the factors involved in a complete reconditioning of a worn chain by reannealing are:

1. The degree of refinement of grain structure from the original heat treatment of forge welded chain.
2. The degree of plastic deformation or cold work during service.
3. The degree of temperature above the A_{c3} point and rapidity of cooling from this temperature.
4. The duration of the heating at and above critical temperatures.

Suggested heat treating practice for chains:

Heat treatment after forging—heat uniformly to above the finish forging temperature (1900 deg. Fahr.). Hold for 1 hr. for each inch of cross section of largest part of chain (ring or hook). Then cool in air to black heat (700 to 800 deg. Fahr.). Reheat uniformly to just above the A_{c3} point, hold for 1 hr., then cool in air to approximately 1000 deg., then slowly to room temperature.

For Service Annealing—Heat chain uniformly to above the A_{c3} temperature for complete recrystallization. Hold for at least 1 hr. at temperature and cool in air to a black heat, then slowly to room temperature. The first part of this practice is not in general use and has been given little attention. But its observance contributes probably more to the life and performance of a chain than even the selection of the most suitable material.

To Avoid Wastage of Link Surfaces

While it is true that annealing of chain above the A_{c3} point will correct cold work and eliminate any possibility of gross crystallization, no test or proof is offered that low annealing temperatures will not give the same desirable practical result—that of freeing chain from brittleness—according to C. G. Lutts, metallurgist Boston Navy Yard, in his discussion of Mr. Merten's paper. The practice of low-temperature annealing of chains has been in effect for some years and the results generally have been satisfactory.

One very practical objection against long soakings above the A_{c3} point is that, at such high temperatures, the metal of the chains oxidizes and wastes away rapidly. Frequent treatments at these temperatures are known to shorten seriously the life of chains, because of the rapid decrease in "wire" diameters and the excessive softening of the metal. The choice is between the costly and very severe high-temperature treatment and the possibility that gross crystalli-

zation, if developed with low-temperature annealing, may be found weakening.

As is well known, the severity of cold work determines the beginning of recrystallization and the temperature at which gross crystallization sets in. But the temperature range of 1200 to 1500 deg. Fahr. is one successfully used today for periodic annealing of chains, and instances of gross crystallization are not reported.

It is questioned if the erratic failure of chain may perhaps reasonably be explained on the basis of internal stresses, plus a lack of ductility in the work-hardened surface, plus the added stress, possibly of only a normal working load, which combined exceed the strength of the metal. Does the delicate balance between these internal stresses and the ready susceptibility to intensification or relief explain this erratic failure? It is submitted that a successful attack on the problem of chain failures, and of corrective heat treatments, has to be led with a study of internal stresses and better understanding of them.

Navy Practice with Anchor Chain

Stating that the United States Navy has experimented with anchor chains of wrought iron and also of high-carbon cast steel, Lt. Comdr. H. N. Wallin, Construction Corps, United States Navy, Bureau of Construction and Repair, Washington, continued the discussion of Mr. Merten's paper. The author's views as to cold working of chain in service, with consequent local embrittlement and eventual chain failure, have been substantiated by Navy experience. Often wrought iron chain links of 2½-in. wire have fractured under small loads, or in some cases when merely dropped upon a concrete floor from a height of 15 or 20 ft.

Usually cold working is accompanied by a reduction in the mean diameter of the chain links, due to the plastic

deformation described. The Navy makes a practice of condemning such chain, so far as anchor use is concerned, when this reduction, whether due to cold working or to abrasion, reaches 10 per cent of the original diameter of the links.

It has been found in Navy practice that relieving of stresses by periodic annealing has greatly reduced the failures of anchor chains. While the combined heat treatment and annealing of chains as proposed would be beneficial, it must be emphasized that neither heat treatment nor annealing is a panacea. Neither one will reconstruct or restore chain which has been excessively deformed by stresses beyond the elastic limit.

It has been determined that high temperatures are required to relieve the strains induced in wrought iron chain by the process of manufacture. For a high grade, double refined iron, the temperature of 1760 deg. Fahr. was found to give the best results. The chain is held at that temperature for about 10 min. and then is cooled in the air. The use of lower temperatures resulted in weaker and less substantial chain, while higher temperatures gave no additional improvement in strength or other qualities.

In the periodic reannealing of wrought iron chain, the United States Navy has found best results were obtained by heating the chain to 1290 or 1300 deg. Fahr., holding it there for 3 hr., and then cooling it in the air or in the furnace. The German Navy, however, reports the belief that heating to 1110 to 1200 deg. Fahr. and holding for 6 hr. gives the best results; while higher temperatures are said to cause considerable wastage of metal from scaling.

Cast steel anchor chain, as used by the United States Navy for the last eight or ten years, is high in both carbon and manganese. The best heat treatment has been found to include heating to 1650 deg. Fahr., quenching in water for one minute, drawing to 1100 deg. and holding there for

News and Sidelights of National Metal Week

A SPECIAL train from Chicago brought about 90 Chicago, Detroit and other steel treaters, gathered in part on the way. By way of diversion a political poll was taken during the trip which revealed about 90 per cent in favor of the Republican nominee.

THE executive secretary, C. E. Hoyt, and the technical secretary, R. E. Kennedy, of the American Foundrymen's Association were interested visitors.

THE Philadelphia Chamber of Commerce tendered a luncheon the first day of the convention at the Benjamin Franklin Hotel in honor of the officers of the various technical societies. The affair was enlivened by a welcoming address by the mayor of Philadelphia, Harry A. Mackey.

TWO foreign steel men, F. C. A. H. Lantsberry and C. L. Bailey, with their wives, were among the visitors. Mr. Lantsberry is an official of William Jessop & Sons Co., Ltd., Sheffield, England, and has attended several steel treaters' annual gatherings. He presented a paper at the Boston convention. Mr. Bailey is from Toronto, and is the manager of the Canadian branch of the same British steel company. He succeeded his father who was the active head for many years.

ALSO present from Great Britain was Charles Wardlow, the present head of S. & C. Wardlow, of Sheffield. He was in the company of his New York

representatives, the Hoyt brothers, and, coming chiefly for the Metal Show, set sail for England on Oct. 13 after barely a week in this country.

IT was interesting as well as profitable to listen to Dr. W. H. Hatfield enter into the technical discussions. He has a happy manner of getting across critical comments, favorable and otherwise.

IF it had been made to order, the weather for the activities of National Metal Week could not have been better. There were five days of sunshine and warmth which made the long distance between the hotels and the Commercial Museum of small consequence. And the excellent taxicab arrangements minimized transportation difficulties.

THE Campbell Memorial lecturer this year, Dr. W. H. Hatfield, must have been gratified at the reception he received. An attendance of about 550 established a record for such a meeting. It tendered him a warm greeting before and after the lecture. Each one of those present was presented with a printed copy of the complete lecture only parts of which were touched on in his one-hour address.

PLANT visitations were, of course, a feature of daily occurrence. The Naval Aircraft Factory, Leeds & Northrup Co., Riehle Brothers Testing Machine Co., Brown Instrument Co., and Victor Talking Machine Co., were among the man-attracting magnets.

ANOTHER prominent British metallurgist will soon visit American co-workers. Ulick R. Evans, Cambridge University, Cambridge, England, is to be the Institute of Metals lecturer in February, 1929.

ANNOUCEMENT was made in the week that the (British) Institute of Metals will probably visit the corresponding American society in the fall of 1932.

BOTH the president of the American Institute of Mining and Metallurgical Engineers, George Otis Smith, and the secretary, H. Foster Bain, were present during the week. Both spoke at the regular dinner of the Institute of Metals Division.

TWO committees of the American Society for Testing Materials held a meeting in the week—A2 on cast iron and B2 on non-ferrous metals. There was a large attendance at both.

ENOUGH foundrymen were present by chance and by arrangement so that the cast iron committee of the American Foundrymen's Association held a long and profitable session.

TOTAL attendance for the week is reported as 64,870, slightly exceeding that at Detroit last year.

THERE were 2714 members of the A. S. S. T. present during the week, which is slightly in excess of 50 per cent of the total membership.

2 hr. It is not present Navy practice to reanneal this chain periodically, as the stresses in service are well below the elastic limit of the material.

Cast Steel Chain Lightly Loaded

In adopting cast steel chain, definite sizes were selected as substitutes for the same sizes of wrought iron chain. As the cast steel in chain has a tensile strength of 100,000 lb. per sq. in., compared with only 50,000 lb., in the wrought iron, it is believed that the greater strength of the cast steel chain can safely be placed at 60 per cent above the wrought iron, after allowing for all possible variables in the manufacture of the cast steel chain. No failures have occurred during the period of use of this chain on board naval vessels.

More chain trouble after annealing than before was reported by Fred G. Frisbie, metallurgist Duquesne Steel Foundry Co., Pittsburgh. The wrought iron links apparently lose their rigidity after being heated to 1400 deg. Fahr. This causes them to elongate and results in subsequent inequality in the lengths of chains, which customarily are used in sets of two, four or eight. As the chains must be of equal length to carry loads in a horizontal plane, this situation necessitates considerable blacksmith work in bringing the chains back to uniformity of length.

Wear, Overload and Embrittlement

Only two different phenomena are to be considered in this connection, according to A. V. deForest. These are the effect of wear and overload in producing deformation of the chain, and embrittlement occurring without any appreciable change in the appearance or dimensions of the chain. Gough and Murphy of the National Physical Lab-

oratory in Great Britain say that this brittleness is due to a skin effect, caused by surface hardening resulting from small impacts. The deleterious effect of this action is undoubtedly the major cause of the production of brittleness in wrought iron chains.

Evidence available indicates that, as a result of inter-link action, hammering on the ground, rattling through hawse pipes, battering on chain wheels, cleaning by rumbling machine (in certain cases), the material of the surface of the link—in some instances to a very small depth only—becomes locally hardened to such an extent that its ductility is practically exhausted. The link surface then consists of a thin and highly brittle case covering a core possessing the ductile properties of the best chain iron.

Skin Cracks Extend Through Link

When such a link section is subjected to bending stresses—particularly those caused by shock conditions—the hardened skin strains elastically and then cracks. This crack is of such a type that very great stress concentration occurs at its root. When the crack reaches the underlying ductile metal the latter cannot exert its proper ductility, because of the prevailing conditions of local constraint. Hence, the crack continues its course through the section of the link and produces a fracture which has an entirely brittle appearance.

In closing the discussion on the paper, the author expressed the belief that it is the annealing practice generally, rather than deterioration of the chain material, which gives such trouble as is experienced. It must be remembered always that chains are subjected to compound stresses which cannot well be evaluated in advance. These are much more severe than the straight stresses for which they are figured.

Application of Science to the Steel Industry

TAKING the above as a text, Dr. W. H. Hatfield, director of the Brown-Firth Research Laboratories, Sheffield, England, first outlined the problems now awaiting solution, and then proceeded to indicate the way in which science has aided metallurgists in producing the various special steels now available. His paper—which constitutes the Edward De Mille Campbell Memorial Lecture for 1928—occupies 154 pages of the Society's *Transactions*, and obviously must be consulted in the original for the wealth of data on alloy steels which it contains.

At the outset, Dr. Hatfield calls attention to the fact that "pure" science supplies the knowledge of natural laws. It requires long and painstaking research without any thought of immediate financial reward. Yet recent history is so full of instances where great industrial advances have resulted from thorough understanding of these fundamental laws that the speaker advanced the proposition that Governments should encourage such independent investigations by every reasonable means.

No less admirable is the type of mind that can apply abstract physical laws to the improvement of everyday manufacturing or living conditions. It bridges the gap between pure and applied science. But the diversity of knowledge has become so great as to be beyond the comprehension of one educated mind; consequently, really efficient organizations for industrial research (i. e., for the application of science to industry) must contain several specialists with individual laboratories. While it has frequently been said that the scientific man should endeavor to understand the human element in industry, Dr. Hatfield suggested that it is even more necessary "that industry generally should learn to know, to appreciate and to make the best use of the scientist."

Coming to more specific problems, the lecturer cited

the progress made in getting sound ingots. (He is chairman of the British Iron and Steel Institute's Committee on heterogeneity of steel ingots, which presented voluminous reports in 1926 and 1928.) Whereas carbon steel ingots of medium size used to be bottom-cast, small end up, in a closed mold—a method which caused much secondary piping down the axis of the ingot—the present British practice for high-class metal has become standardized upon big-end up, top poured with refractory-lined sink heads. While a marked degree of improvement has resulted from such a change, there is still so much unknown about the physical properties of molten and just solid steel, and about the chemical reactions between metallic and non-metallic ele-

Campbell Memorial Lecturer for 1928



FOR many years Dr. W. H. Hatfield has been associated with the Brown-Firth Research Laboratories, Sheffield, England. His scientific and metallurgical education was received at Sheffield University, where he obtained his doctor's degree. He is a member of the council of the Iron and Steel Institute and of several other societies. His work on stainless and special alloy steels is well known, as are also his contributions to technical societies and periodicals. He is the author of "Cast Iron in the Light of Recent Research," which has had wide circulation in the United States.

Officers Nominated for 1929

President: *Dr. Zay Jeffries, research director Aluminum Co. of America, Cleveland.*
Vice-President: *R. G. Guthrie, metallurgist Peoples Gas, Light & Coke Co., Chicago.*
Secretary: *W. H. Eisenman, who has held the office since the Society was organized.*
Directors for two years: *A. H. D'Arcambal, Pratt & Whitney Co., Hartford, Conn., and F. T. Sisco, Wright Field, Dayton, Ohio.*



ZAY JEFFRIES



R. G. GUTHRIE



W. H. EISENMAN



A. H. D'ARCAMBAL



F. T. SISCO

ments at those high temperatures, that further progress by the method of trial and error is bound to be slow.

Dr. Hatfield also selected from his long prepared dissertation the subject of strength at high temperature as being worthy of special mention. It is known that steels will frequently show permanent set after carrying a load for a long time at high temperature. The lecturer believes that as long as a metal remains a crystalline aggregate there will be a range of stress wherein it acts in an elastic manner. This range becomes very small as the melting point is reached, and to determine it for various elevated temperatures requires careful work with equipment of high precision. Table I shows the limiting creep stresses ("the stress above which there is a steady continuous creep of a measurable rate") as determined by the National Physical Laboratory. The same authority states that adding

carbon up to 0.50 per cent is incapable of raising the limiting creep stress above 11,200 lb. per sq. in. at 500 deg. C.

Table I.—Limiting Creep Stress for Low-Carbon Boiler Tubes

Temperature	0.10 Per Cent Carbon	0.17 per Cent Carbon
400 deg. C.		30,000 lb. per sq. in.
450 deg. C.		19,000 lb. per sq. in.
500 deg. C.	7,840 lb. per sq. in.	10,750 lb. per sq. in.
550 deg. C.	2,910 lb. per sq. in.	5,380 lb. per sq. in.
600 deg. C.	1,340 lb. per sq. in.	2,690 lb. per sq. in.

For rapid determinations which have been found useful by designers of equipment, the Brown-Firth Laboratories have devised a test for "time-yield." This arbitrary value is found by discovering the stress at the given temperature which causes a permanent set of 0.5 per cent on the gage length (measured to an accuracy of 0.01 per cent of the gage length) within 24 hr., and no further increase for the next 48 hr.

Important Events of the Week

AT the annual meeting of the society the usual reports of the president, the secretary and the treasurer revealed the excellent condition of the organization. Announcement of the report of the nominating committee for officers in 1929, of which W. E. Reeder, General Electric Co., Schenectady, N. Y., was chairman, was formally accepted. The nominees are mentioned on another page.

The annual banquet at the Hotel Benjamin Franklin was the usual success. An excellent address by E. P. Warner, assistant secretary of the United States Navy for Aviation, was the feature. Douglass Mulloch, the well known poet of Chicago, enlivened the evening with one of his usual able and humorous speeches.

Other important events of the convention are briefly reported in the following:

Howe Medal Conferred on Two Authors

Each year, by recommendation of a special committee and by a vote of the board of directors, a medal—the Henry M. Howe medal—is conferred on the author or authors of

the most meritorious paper printed in the *Transactions* during the previous year ended with July. This year at the annual banquet President Hughes bestowed the medal (two in this case) on Prof. O. E. Harder and R. L. Dowdell, University of Minnesota, Minneapolis, for their paper, "The Decomposition of Austenite," published serially February to July, 1927.

Past President's Medal

A new custom recently inaugurated is the bestowal of the past president's medal, always upon the man who was president the preceding year. The last recipient, R. M. Bird, presented the medal this year at the banquet to J. Fletcher Harper, president during 1927.

Philadelphia Chapter Receives President's Bell

It is customary for the president of the national society to present each year the president's bell to some chapter which has distinguished itself during the year. President Hughes called upon Dr. R. H. Patch, chairman of the Phila-

delphia chapter, to accept the bell, largely in recognition of the heat treatment courses which that chapter has been and is conducting in cooperation with Temple University.

Next Year's Convention in Cleveland

The 1929 convention and exposition will be held in Cleveland, the exact date to be announced later. An annex has been completed for the large auditorium and ample facilities for a large exhibit will be available.

Institute of Metals Dinner

THE "dinner meeting," which only a few years ago was attended by few except the active officers of the division, has grown into the most important social event of the Institute of Metals convention. This year the guests included George Otis Smith and H. Foster Bain, president and secretary of the American Institute of Mining and Metallurgical Engineers, and fifty or more ladies, wives and friends of the members. W. M. Corse, secretary of the division, announced that the British Institute of Metals had accepted an invitation for a joint meeting in America, and it will be held probably in 1932. Dr. Ulick R. Evans of Cambridge University will deliver the annual Institute of Metals lecture in New York early in 1929. Sam Tour, chairman of the meetings and papers committee, has arranged for a series of papers on new aspects of the corrosion problem for that same occasion.

Frederick M. Becket, vice-president Electro Metallurgical Corporation, New York, delivered a formal address on the history and present position of chromium and chromium alloys. He has been investigating these alloys and production methods for chromium and ferrochromium for 25 years, almost to a day of the address. One interesting side-

Howe Medallists for 1928



O. E. HARDER



R. L. DOWDELL

light on stainless iron was divulged by his laboratory records, showing that he prepared a number of these low-carbon high-chromium alloys and exposed them to furnace atmospheres at high temperatures in order to determine their heat resistance properties. Since not a single piece remained to exhibit its peculiar resistance to tarnish at room temperature, the announcement of stainless iron was delayed by several years. Doctor Becket's paper, which is of such a nature that it cannot well be abstracted, will appear later in print.

Widening Application of Products and Equipment Emphasized in Exhibits

ADVANCES in the development of special and alloy steels and demonstration of a wide variety of improvements in the technique of both electric and oxy-acetylene welding were features of the National Metal Exposition held the past week at the Philadelphia Commercial Museum. Although many steel companies were not able to show radical departures from the standpoint of either method or finished products, they were all able to prove important progress in the commercial application of high-grade alloy steels and to show that the steel industry has been able to meet the demand of an exacting industrial structure for specialized products upon a reasonable commercial basis.

But the finished steel products would never have been possible had it not been for the continued evolution in the design and operation of furnaces and heat-treating appliances, of testing and control equipment and of the highly accurate and dependable metal working tools, many of which were in operation in the exhibition hall. Thus the exposition might be termed a complete cross section of the development, manufacture and utilization of steels and alloys during the past year.

The progress and diversification of

heat treating was emphasized in a popular exhibit of one company contrasting the hut of the alchemist of the middle ages with the modern research laboratory. The advantages of different modern methods were ably demonstrated. Electric heat applications of a new and unusual nature were shown by a number of companies, and it would seem that the electric industry is actively seeking outlets for its products in many new fields. Keen interest was displayed in gas furnaces, also, and the many fine examples of units of both the gas and electricity utilizing types indicated that there is ample room in the heat treating industry for a wide application of both forms of heat energy. But in this line of equipment, as in many others, the visitor was not so impressed by departures in design or operation as by the diversity of application which is taking place. The American Gas Association, to illustrate, presented exhibits of its various members and a completely outfitted metallurgical laboratory, the latter covering the efforts of this group to concentrate its activity on individual problems.

New Cutting Tool Introduced

Demonstration of Carboloy, a new cutting tool developed in the research

laboratory of the General Electric Co., attracted considerable interest. It was shown cutting cast iron at a rate of 140 to 160 ft. per min. and occasionally even higher. It is an alloy of tungsten, carbon and cobalt and is a product of the hydrogen furnace. The exhibit included many examples of materials cut with Carboloy and comparisons with the work of high-speed tool steels. Its most economic application is said to be on jobs involving low tensile materials. The development and application of Carboloy was dealt with in a paper at one of the technical sessions and is discussed elsewhere in this issue.

Castings in Group Exhibits

The success of manufacturers producing kindred products to join together in an effort to improve quality was illustrated in the exhibits of the Electric Steel Founders' Research Group, the Steel Castings Development Bureau and the Gray Iron Institute, Inc. These exhibits were confined almost entirely to commercial castings produced for the trade and emphasized general utility work rather than exceptional or difficult applications. Of particular interest in the steel castings group were a turbine diaphragm showing the insertion of the metal blades in the mold as-

sembly, a number of locomotive superheater return bends tested to 6000 lb. per sq. in. and a hardening tray the holes in which had been cast rather than bored. The gray iron exhibit contained a number of castings of interest both from the standpoint of use and manufacture and the electric steel group attracted interest for similar reasons. A visit to any of these exhibits provided convincing evidence of the efforts of the industries represented to secure a wider market for their products by diversity of application.

Testing and Control Apparatus

Testing and control apparatus had an important place at the exhibition, and as usual a number of instruments were shown for the first time. The tendency toward greater precision was emphasized and automatic control features which have been developed recently attracted considerable attention. Some of the more important innovations were described in the pre-convention issue of *THE IRON AGE*, Sept. 27, and others have been dealt with in more detail in previous issues.

An opportunity to note the recent advances in the welding industry was offered in the American Welding Society's exhibits of welded products as well as by the operating displays of many companies manufacturing welding apparatus and equipment. The booth of the society contained a wide assortment of welded products, including automobile bodies, metal furniture, ornamental iron products, structural steel sections and many others. In another booth part of a welded airplane fuselage was shown. Another interesting welding application was offered in a gas refrigerating unit requiring more than 50 welds and which had been tested to 900 lb. per sq. in.

More than half the exhibits of welding equipment included operating units which drew constant attention. The wide assortment of products offered little opportunity of discerning any particular trend, but it was indicated that the welding industry is making rapid strides in all departments and is quickly achieving the economies in operation which industry demands. Safety features were em-

phasized. A number of companies displayed examples of welding as applied to non-ferrous metals with a number of applications in operation.

May Drop Odd Sizes in Welded Chain

WASHINGTON, Oct. 16.—Manufacturers representing more than 85 per cent of the production of welded chain have unanimously agreed upon a simplification program providing for the elimination of several hundred odd sizes from their list of standard numbers. The Division of Simplified Practice, Department of Commerce, has been requested to call a general conference of manufacturers, distributors and users of welded chain at which the manufacturers' recommendation will be presented for adoption.

Structural Fabricators Take Up Business Problems

A new program for the fabricated steel industry is to be taken under consideration by the American Institute of Steel Construction at its annual convention to be held at Biloxi, Miss., Nov. 13 to 17. During the past four years attention has been concentrated largely upon technical problems and engineering standards. The new program will embrace problems of buying and selling, out of which it is expected to evolve a code of ethics or trade practices.

To introduce the subject in its broad scope, the institute has scheduled three addresses at its annual convention. The buyer's attitude as related to the present competitive conditions among sellers will be discussed by L. F. Boffey, editor of *Purchasing Agent*; and the character of

salesmanship essential to meet present-day economic conditions will be discussed by C. K. Woodbridge, president Kelvinator Corporation, Detroit, and past-president International Advertising Association. Following these, Abram F. Myers of the Federal Trade Commission will address the convention on the powers and duties of trade associations. These three addresses will constitute a symposium on the business problems of the industry.

Puts Pickling Compound on the Market

A new pickling compound, a product of the E. I. duPont de Nemours & Co., will be marketed by the Research Manufacturing Co., Oak Lane Station, Philadelphia. It is stated that it not only removes the scale or oxide, but it stops when it has removed the scale. As a consequence, it conserves the acid content and minimizes the loss of the steel itself. In other words, it is said to contain within itself an inhibitor, preventing over-pickling or pitting of the steel.

Buffalo Forge Celebrates Fiftieth Anniversary

The fiftieth anniversary of the Buffalo Forge Co. was celebrated at the annual three day sales convention of the Buffalo Forge Co., Buffalo Steam Pump Co., and the Canadian Blower & Forge Co., Ltd., held at Buffalo.

Representatives of over forty branch offices of these associated companies were present. The Canadian plants sent salesmen from Kitchener, Toronto, Winnipeg, Montreal and Vancouver. Both the South American and Porto Rican offices had one representative.

THIS plane, owned and operated by E. J. Henke, president American Electric Fusion Corporation, Chicago, was used by him to reach the Metal Exhibition at Philadelphia last week



Business Analysis and Forecast

Steel Industry Has Much Activity Ahead

Demands of Consuming Industries Show Little Let-up—Railroad Orders Not Improving but Construction Remains High

BY DR. LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

WHEN allowance is made for the usual seasonal ups and downs, and for a small factor of long-time normal growth, we find that steel production increased a little in September and was 19 per cent above "normal." This represents almost exactly the same annual rate of production as existed in April and again in July. The unfilled orders of the Steel Corporation showed about the usual seasonal increase in September, and the rate of gain in the adjusted figure was only the same as that which occurred in the preceding month. From this, it may be inferred that new orders have been coming in at a rate that is only a trifle ahead of shipments. The average price of finished steel for the month was about 2.351c., which compares with 2.348c. in August.

Pig iron production, as adjusted, showed a slightly downward trend in September and was only about 8½ per cent above our estimate of normal, against 9.6 per cent above in August. The price of pig iron advanced considerably, the average for the month being \$17.60, which compares with an August average of \$17.11.

The following conclusions seem justified as to the future trend of prices

in the industry: (1) Steel production is too ample to allow much more than continued firmness at the present level of prices. With production 19 per cent above normal, and forward buying no larger than it is, the situation is little better than one of equilibrium. (It is unusually dependent upon the automobile industry.) (2) Pig iron production, however, is relatively low and pig iron prices are cheap. Further advances in pig iron prices seem to be a reasonable expectation during the next two or three months. (3) The situation as to steel scrap is decidedly different from that in pig iron. Scrap is dear. It is too high in comparison with pig iron prices. It seems probable that the scrap markets are very near their peak and that considerable declines will occur before the end of the year.

Steel Activity Exceptionally High

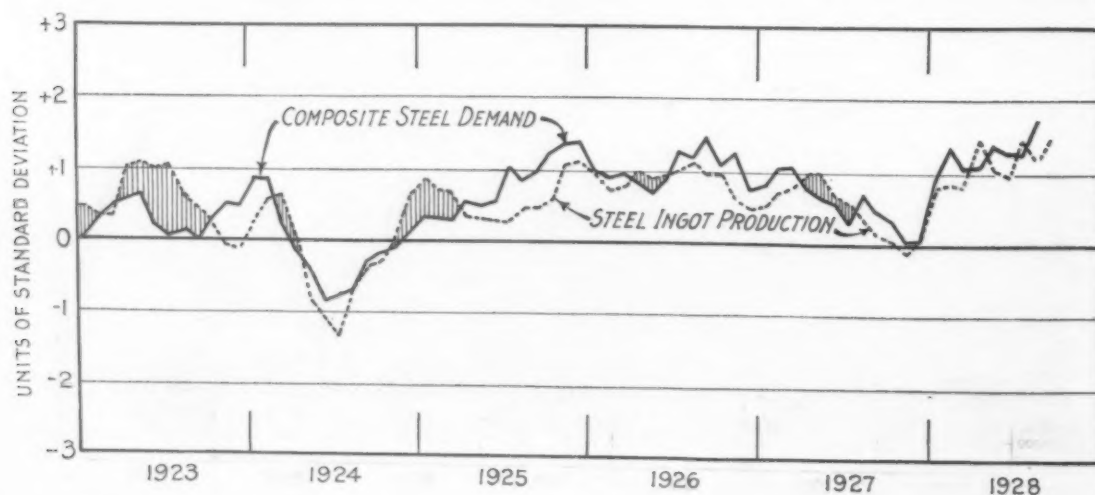
OUR composite steel demand line rose in August and reached a new high point for recent years. This means that average activity in the chief iron and steel consuming industries is high, and continues amply to justify the present high rate of

steel production. The steel output, considering the season, also increased in September, but it is clearly in line with the requirements of the country.

The rise in the composite demand line reflects an increase in activity that was quite general among the various factors included in this index, such as automobile production, railroad transportation, manufacturing, mining and exports. Farm purchasing power was well maintained. Machine tool orders showed a large increase. Only the building industries indicated a decline.

The future promises a sustained high level during the winter months. About the only item that is practically certain to decline is building. The situation here is already reflected in the market for nails, pipe, etc. Residential and other building operations covered by municipal permits will continue to decline. However, a large volume of construction of public works and roads seems assured.

Probably railroad buying will be disappointing, also, as we find that freight traffic in September failed to show the usual seasonal gain, though some allowance must be made for the fact that September this year had only 25 working days. The outlook in



Steel Production Remains in Close Agreement with the Level of Composite Demand. This latter is higher than at any season in recent years

the oil industry is also somewhat less favorable than it was a month ago, production of both crude oil and refined products being a little in excess of demand and declines having been forced recently in refinery prices for gasoline. The situation here is complicated by the fact that increased drilling, while it would bring a demand for some kinds of steel, would injure the oil industry as a whole,

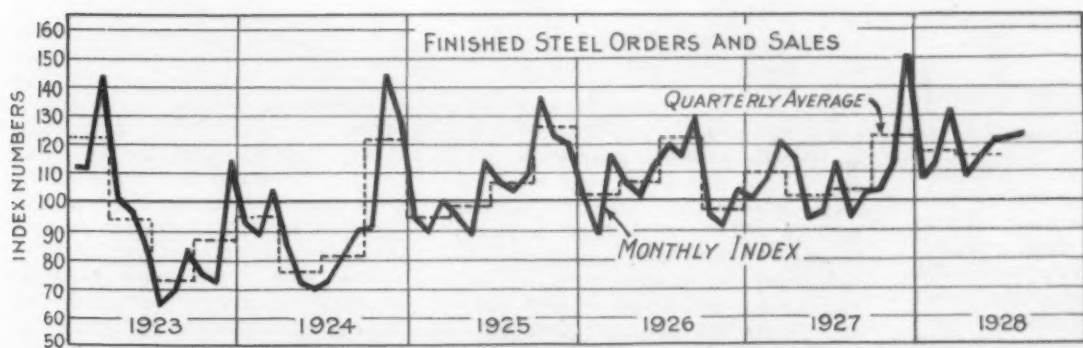
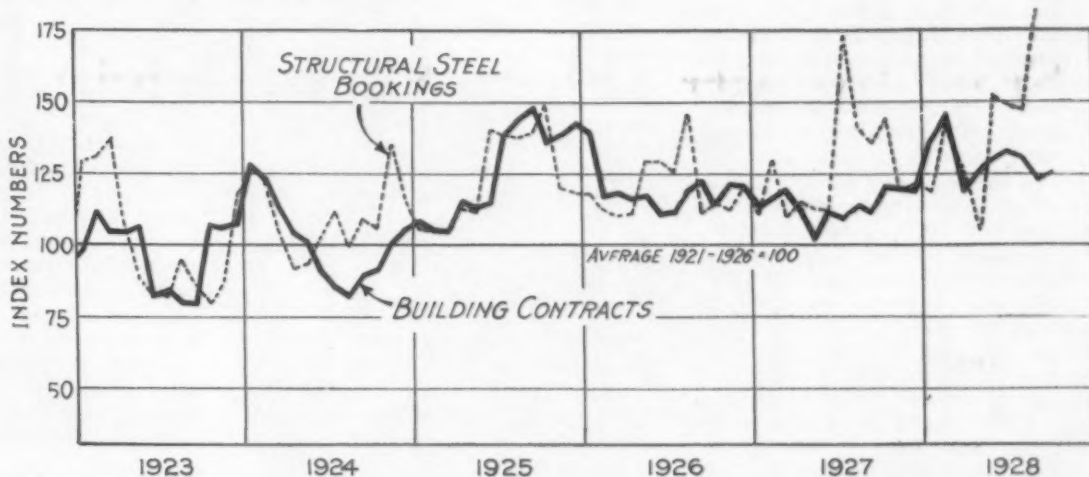
and that would ultimately be unfavorable to the interests of the steel industry.

On the other hand, the boom continues in the automobile industry. General manufacturing is much more active than normally and promises to continue at a high rate for several months. The machine tool orders barometer gives a very favorable reading. The general business outlook

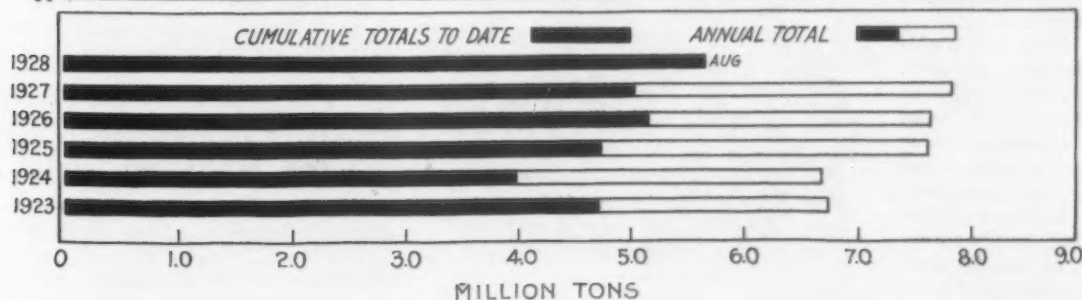
indicates a sustained activity and approximate stability near present levels through the winter.

One might conclude that the demand for bars will be sustained at about present levels; that the plate demand will continue dull, improvement in some directions offsetting declines in others; that sheet requirements will be sustained at their present high levels; that structural steel, wire and

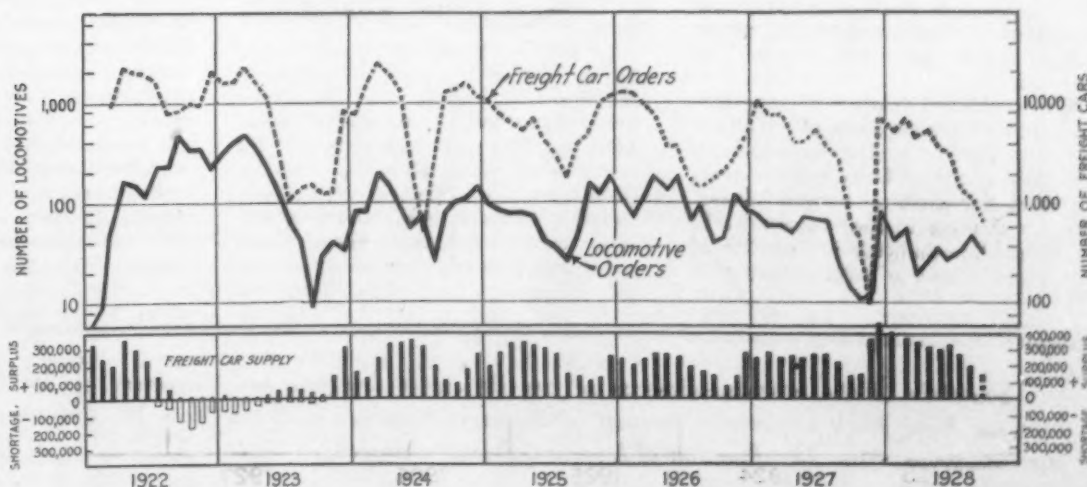
Building Contracts Have Remained High, But the Strength of Structural Steel Bookings Indicates Considerable Activity in Engineering Projects Other Than Buildings



Buying of Finished Steel Was Higher in August Than in That Month in Any Previous Year Shown. The cumulative total is much the greatest for any year on the diagram



Locomotive and Railroad Car Orders Continue Discouragingly Low. And the surplus of cars is still so large that there is no indication of immediate need for heavy purchases



pipe demands will decline. However, requirements for heavy structural steel should continue large for the remainder of the year.

Sales Highest for Any August

ORDERs and sales figures covering some of the chief items of finished steel made a further gain in August. This is notable as being the first August increase in our sales index since 1924. The latest figure is the highest for the month that we find on record. It brings the total for the first eight months of 1928 to a level much in excess of any similar period, and in all probability assures a new yearly record. It is possible, however, that the third quarter total may not quite equal the third quarter of 1926.

There was a large seasonal decrease in the sales of sheets, in spite of high automobile activity, but the bookings of structural steel, plates and steel castings all gained in August. Sales of steel castings are holding better than usual at this season, and the August increase was the first that has occurred in that month since 1923. Sales of plates showed about the usual seasonal gain.

Greatest Structural Steel Orders on Record

AS to structural steel, it is important to note the building situation. This can be understood only by beginning with the money market. Here we find money rates tight and, in spite of a little easing in October and November, they are likely to continue much above the levels of the last few years. As a result, issues of long-term mortgage bonds for building purposes have declined sharply. Building permits slumped badly in September and were about 10 per cent under a year ago. Contemplated new construction was also smaller, and very low. In fact, the foregoing items are near to the low point reached in 1924. But construction contracts, actually awarded, declined less than usual in September and were about 11 per cent above a year ago. This apparently was due to heavy construction of roads and public works, which items are not covered by permits.

The continued volume of large construction contracts, some of which are not influenced by current business considerations, means large requirements of steel for several months ahead. But the declines in bond issues and in building plans indicate the coming of a reduced volume of awards and ulti-

mately of a lower level of building operation.

Bookings of structural steel usually decrease in August, but this year they gained, rising from 296,300 tons in July to 356,300 tons. Our adjusted index is the highest on record. Nevertheless, it may be noted that the curve of structural steel bookings has acted this year somewhat as it did in 1926, and it is so far above the curve of building contracts that it does not seem that it can continue at present levels very long. Weekly trade reports, however, indicate that the September volume was running at about an average of 36,000 tons a week, in comparison with less than 34,000 tons a week in August.

Locomotive and Car Orders Low

SOME hopes have recently been expressed that the buying of railroad equipment will improve, and better inquiries are actually reported, particularly in the Middle West. The

cold statistics, however, give little evidence of actual gains. As shown in the chart, the trend of freight car orders is still downward and locomotive orders continue close to the lowest levels on record. According to *Railway Age*, domestic orders for steam locomotives amounted to only eight in September, and there is not the slightest indication of improvement, as the total unfilled orders for all locomotives continue near the record low point.

Freight car orders, at 1236, showed a seasonal gain from 767 in August, and were nearly double the orders of a year ago. If any improvement is occurring, it is in this branch of equipment. Surplus cars, though above the level of recent years, have shown a larger than usual reduction since July. But there is still a good surplus, considering the season, and railroad freight traffic has shown little tendency to expand. The gross revenues of the railroads in August were actually lower than a year ago, and this indicates that continued economy will be necessary.

Ohio Employment Gains Steadily This Year

Industrial employment in Ohio has shown an increase every month since the low point of last January, attaining in September the highest level since October, 1926, says the current bulletin of the Bureau of Business Research of Ohio State University. The index for September stood at 111, with an average month of 1923 taken as 100. In the iron and steel industries, the September employment index of 101 was 2 per cent greater than in August and 12 per cent greater than in September, 1927. However, employment during the first nine months of 1928 was 1 per cent less than in the same period of 1927. The number of wage earners in the machinery group decreased 1 per cent from August, but was 3 per cent greater than in September, 1927.

Warwick Furnace Property Brings About \$200,000

At public auction on Oct. 9, 10 and 11, the real estate and equipment of the Warwick Iron & Steel Co., Pottstown, Pa., realized a total of about \$200,000. The equipment was sold for slightly less than \$100,000. This included two blast furnaces with stoves, blowing engines and boilers, a machine shop, blacksmith shop, power house and foundry equipment, several

ore cars, four industrial locomotives, three locomotive cranes, about 10 miles of 90-lb. rails, a 300-ft. span revolving crane and a quantity of scrap.

The Warwick company was incorporated in Pennsylvania June 9, 1899, as a successor to the Warwick Iron Co. The authorized capital stock of the Warwick company is \$1,500,000 in shares, with a par value \$10 each, so that the amount received from the sale of equipment and properties, after deduction of costs, is believed to be sufficient to pay slightly more than 10c. on the dollar.

Russian Commission to Buy Farm Machinery Here

Armed with authority for the purchase of large supplies of tractors, agricultural implements and factory machinery, an official economic mission from Soviet Russia arrived in New York on the *Mauretania* last Friday. A report recently submitted to the Economic Council by the Central Metal Department stated that it will be necessary within the next few years to supply the rural population of Russia with 115,000 farm tractors and well over 500,000 tractor plows, drills, bores and other kindred equipment. It is expected that a large part of this material will be purchased from American companies.

Schedule of the next instalments of the Business Analysis and Forecast, by Dr. Lewis H. Haney, Director New York University Bureau of Business Research, follows: Nov. 1—Activity in Steel Consuming Industries; Nov. 15—Position of Iron and Steel Producers.

Tipple on Wheels Prepares Coal at Dock

Duluth Blast Furnace Company Solves
Problem of Separating
Coking Coal from
Domestic Sizes



A COAL tipple on wheels has been installed on a new coal dock of the Zenith Furnace Co., Duluth, Minn. This traveling plant gives the equivalent of mine preparation of coal, according to a description of N. L. Davis, Link-Belt Co., Chicago, thereby solving the problem of separating coal needed for making blast furnace coke from fuel supplied to domestic consumers.

The coal is delivered to the dock by boat as mine-run and is delivered to separate piles by two electrically operated bridge tramways of the man-trolley type, having a span of 375 ft., and equipped with 10-ton buckets for free digging and a cleanup bucket with 24-ft. spread.

The tipple, which can travel on its own tracks the full length of the dock, can be fed by either of the bridges. An apparent obstacle to the construction of a traveling tipple was the cost of concrete foundations and tracks. This was overcome by designing a flexible tipple structure and rock ballasting the tracks. Wheel loads were reduced to comply with American Railway Association specifications and reasonable limits were allowed for track variations in grade and gage.

The traveling plant prepares domestic sizes and loads them, singly or in mixtures, into box or open-top cars without the aid of chutes. The greatest drop from the time the coal leaves the screens until it is loaded is not more than 8 in. and its greatest ve-

locity is 150 ft. a minute, except in loading box cars, when the speed is limited by that of a box car loader belt. Coal may be loaded simultaneously into cars on four tracks.

Coal is prepared at the rate of 500 tons an hour. If the percentage of slack or smaller sizes in the run-of-pile coal is excessive, the feed to the screens can be increased to maintain full loading capacity in the prepared sizes. The surplus of the smaller sizes is automatically returned to dock storage on a dock return conveyor with which each bridge is equipped. Conversely, if slack is deficient, the feed can be reduced, to prevent overloading the screens. Lump, egg, stove and nut coals are prepared, and any combination of these sizes, or mixtures,

may be loaded, the remaining coal returning direct to dock storage.

The plant has two hoppers, one of 50 tons capacity for stove and nut coal, which serves the stove and nut screens, and one of 70 tons capacity, for slack, which discharges through a motor-operated gate and spout to cars beneath. Both hoppers may be emptied to dock storage in 20 min.

The slack coal requirements of the coke ovens are 800 tons daily. The slack is obtained from three or four kinds of coal, which must not be mixed in handling. During the light shipping season, one or all of the domestic sizes remaining after the slack is removed from the run-of-pile coal must be returned to the storage piles from which they came.

Production of Portland Cement Near Peak

Production of Portland cement is reported by the United States Bureau of Mines to have been 17,856,000 bbl. in September—the largest September production ever reached and the third highest for any month. The figure was exceeded only by August, 1928, with 18,730,000 bbl., and August, 1927, with 18,315,000 bbl. In September, 1927, the total was 17,505,000 bbl.

Production for the third quarter of this year (54,031,000 bbl.) was the greatest for any quarter yet reached. This compares with 53,228,000 bbl. in

the third quarter of last year, and with 48,217,000 bbl. in the second quarter of 1928. For the first nine months production has made a new record, at 131,036,000 bbl., displacing the previous January-September record of 128,286,000 bbl., made last year.

Shipments have been above production ever since the end of April. The amount shipped in September was 20,462,000 bbl., compared with 21,970,000 bbl. in August. The only other earlier month surpassing September in shipments was August, 1927, when a total of 21,411,000 bbl. went out. In September, 1927, shipments were 19,828,000 bbl.

Fabricated Structural Steel

Awards of 34,500 Tons Include Many Small Tonnages— New Projects Call for 13,300 Tons

ALTHOUGH awards in the past week amounted to about 34,500 tons, only a few were in excess of 1000 tons. The largest was 6000 tons for a plant at Asheville, N. C. Another sizable award was 3500 tons for a building in Memphis, Tenn. New inquiries total 13,300 tons, of which 5000 tons is for a section of the New York subway. Awards follow:

NEW YORK, 3400 tons, Y. M. C. A. building in West Sixty-third Street, to Harris Structural Steel Co.; reported last week to unnamed fabricator.

NEW YORK, 2800 tons, Salvation Army Building in West Fourteenth Street, to Hedden Iron Construction Co.; reported last week to unnamed fabricator.

BROOKLYN, 200 tons, building for Brooklyn Ash Removal Co., to Shoemaker Bridge Co.

WILDWOOD, N. J., 400 tons, pier, to unnamed Philadelphia fabricator.

STATE OF NEW JERSEY, 250 tons, highway bridges, to American Bridge Co.

PHILADELPHIA, 1500 tons, addition to Lewis building, to Shoemaker Bridge Co.

PENNSYLVANIA RAILROAD, 3500 tons, 17 small bridges, to American Bridge Co. and unnamed fabricators.

COATESVILLE, PA., 130 tons, girders for Lukens Steel Co., to Massillon Bridge & Structural Co.

PITTSBURGH, 200 tons, ore bridge and river unloading equipment for Davison Coke & Iron Co., to Dravo Contracting Co.

ALBUQUERQUE, N. M., 180 tons, addition to Harding High School, to Jones & Laughlin Steel Corporation.

ATLANTA, GA., 1200 tons, Rhodes-Haverty Building, to Ingalls Iron Works.

TAMPA, FLA., 200 tons, airplane hangar and passenger station, to Ingalls Iron Works.

RUSSELLVILLE, ALA., 300 tons, mine improvements for Woodward Iron Co., to Virginia Bridge & Iron Co.

ZAPATA, TEX., 150 tons, International Bridge over Rio Grande River, to Orange Car & Steel Co.

SHREVEPORT, LA., 610 tons, municipal memorial auditorium, to Orange Car & Steel Co.

ASHEVILLE, N. C., 6000 tons, American Enka Corporation plant, to Virginia Bridge & Iron Co.

MEMPHIS, TENN., 3500 tons, Sterick Building, to Virginia Bridge & Iron Co.

NEWARK, N. Y., 500 tons, State Teachers' College, to R. S. McMannus Steel Construction Co.

PLYMOUTH, MICH., 1445 tons, factory building for Chrysler Corporation, to Whitehead & Kales Co.

SAGINAW, MICH., 300 tons, Adams-Saginaw Building; relet by Flint Structural Steel Co., to Massillon Bridge & Structural Co.

STATE OF MICHIGAN, 100 tons, highway bridges, to Massillon Bridge & Structural Co.

DETROIT, 950 tons, craneway No. 37 and Clayton-Lambert Building for Fisher Body Corporation, to Massillon Bridge & Structural Co.

DETROIT, 150 tons, building for Wood Hydraulic Hoist & Body Co., to Massillon Bridge & Structural Co.

AKRON, OHIO, 800 tons, building for General Tire & Rubber Co., to American Bridge Co.

NEWARK, OHIO, 120 tons, building for Pennsylvania Railroad, to Pittsburgh-Des Moines Steel Co.

MADISON, IND., 300 tons, caissons and coffer dam for bridge, to St. Louis Structural Steel Co.

CHICAGO, 1000 tons, addition to Chicago Club, to A. Bolter's Sons, local.

DU QUOIN, ILL., 300 tons, coal tippie for United Electric Coal Co., to St. Louis Structural Steel Co.

APPLETON, WIS., 500 tons, bridge for Chicago & North Western, to Wisconsin Bridge Co.

MILWAUKEE, 100 tons, addition for Oilgear Co., to Worden-Allen Co.

DAVENPORT, IOWA, 550 tons, bridge for Rock Island Railroad, to American Bridge Co.

HERMAN, MO., 1800 tons, bridge, to Kansas City Structural Steel Co.

CHELAN, WASH., 124 tons, Cashmere bridge, to Pittsburgh-Des Moines Steel Co.

SEATTLE, 100 tons, West Seattle school, to Isaacson Iron Works.

SEATTLE, tonnage unstated, coal pulverizing plant for Pacific Coast Cement Co., to Hofius Steel & Equipment Co.

PORT ANGELES, WASH., 125 tons, addition to Washington Pulp & Paper Co. plant, to Isaacson Iron Works.

BAYWOOD, CAL., 170 tons, apartment building, to Judson-Pacific Co.

SAN FRANCISCO, 2000 tons, power plant

for Great Western Power Co., to Dyer Brothers.

PITTSBURGH, CAL., 2500 tons, tin plate mill for Columbia Steel Corporation, to McClintic-Marshall Co.

PITTSBURGH, CAL., 450 tons; open-hearth furnace, 300 tons and machine shop, 150 tons for Columbia Steel Corporation, to Dyer Brothers.

LOS ANGELES, 2000 tons plates, five 134,000 bbl. tanks for General Petroleum Corporation, to McClintic-Marshall Co.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

NEW YORK, 5000 tons, subway section 6, route 109; bids Oct. 26.

NEW YORK, 2000 tons, 15 barges for New York Central Lines, Dravo Contracting Co. and Atlantic Ellis Co., low bidders.

BROOKLYN, 5000 tons, addition to St. George Hotel; Schroeder & Koppell, Inc., general contractor; reported last week as 2500 tons.

BALTIMORE, 500 tons, Y. M. C. A. building.

STATE OF TENNESSEE, 1300 tons, two highway bridges for State Highway Commission.

MOBILE, ALA., 450 tons, shops for Louisville & Nashville Railroad.

TALLEDEGA, ALA., 750 tons, factory for Bemis Bag Co.

WOLF POINT, MONT., 700 tons, bridge across Missouri River.

OAKLAND, CAL., 170 tons, Jackson Creek spillway for East Bay Municipal Utility District; general contract to Ward Engineering Co.

PORTLAND, ORE., 243 tons, Gardiner bridge over Yellowstone River in Montana; Illinois Steel Bridge Co., low bidder.

Distributors Protest New Sheet Discounts

ATLANTIC CITY, N. J., Oct. 16.—Re-affirming a resolution adopted at a meeting held in Pittsburgh in September, members of the Metal Branch, National Hardware Association, at a meeting here today, again urged producers of sheet steel to reconsider their new policy of reducing the discount on sheets from 2 per cent for cash in 10 days to 0.5 per cent for cash in 30 days. The new discount terms were adopted by all the principal makers of sheets as effective Oct. 1.

The resolution adopted at Pittsburgh, which was printed in part in THE IRON AGE of Sept. 13, page 640, urged the mills to consider the old discount not as an allowance of interest charges, but as a premium for prompt payment of bills. It was suggested at the meeting here today that, with the present small discount allowed by the mills, distributors would be inclined to allow payment of sheet bills to run as long as possible, paying first the statements allowing a larger discount.

Will Not Pass Increased Charges to Customers

Considerable discussion arose at the meeting as to the advisability of passing along the increased charges of the distributors by reducing their discount to jobbers, sheet metal workers and other customers to a corresponding

figure. An informal ballot revealed that 43 of the distributors represented will maintain the old 2 per cent discount to their customers while four have adopted the new terms introduced by the mills for their trade. It was brought out that one warehouse has sought to offset the reduced profit in sheets occasioned by the lessened discount by advancing the price \$2 a ton.

Nearly all the distributors present stated that they could not afford to lower the discount to jobbers at present because they would not be able to stand the increase in accounts receivable which would be almost certain to follow. It was brought out that about half the average distributor's customers had been trained to take advantage of the 2 per cent discount, and that its withdrawal or sharp reduction would take many of these customers out of the prompt payment class.

An organization has recently been set up in Czechoslovakia for the production and sale of steel houses, according to a report received from Consul General Arthur C. Frost, Prague. The company has acquired some foreign patents and plans to sell and erect these houses throughout Czechoslovakia. It is proposed to use only Czechoslovak products in the manufacture of the steel houses so far as it is practicable to do so.

This Issue in Brief

Suggests medium-carbon silico-manganese steel as a substitute for some of the best alloy steels. The silico-manganese steel is cheaper, is easily heat-treated, and compares favorably in physical properties with the alloy steels.—Page 957.

* * *

Fatigue failures frequently occur at sharp corners, keyways, screw threads and tool marks where there is a concentration of stress. Fatigue cracks also originate in clusters of slag particles.—Page 958.

* * *

New tool material cuts cast iron at a rate of 140 to 160 ft. a minute. Tungsten carbide bonded with cobalt ("Carboloy") will scratch sapphire and cut a groove in an alundum wheel. It is claimed to be much superior to high-speed steel, and capable of sustained cutting at speeds several times those commonly used.—Pages 959 and 972.

* * *

Chips will not adhere to cutting tool in machining high-chromium steels, if the steel contains zirconium sulphide, metallurgist declares. Sulphide does not reduce resistance to corrosion, but it does lessen ductility.—Page 953.

* * *

Cuts in half hardening time by conducting nitriding operation at a pressure of 600 mm. of mercury above the atmosphere. Thirty hours are required to get a scleroscope hardness of 90, regardless of pressure. Higher pressures give a deeper case.—Page 954.

* * *

To render sling and crane chains entirely safe for further service, without reducing safety load, they should be heated to a temperature considerably above the transformation range, says metallurgist. But at such high temperatures the metal oxidizes and wastes away rapidly, says another.—Page 960.

Traces gear noises by means of an instrument consisting of a portable cylinder and piston connected to ear-pieces. In device used by Westinghouse the piston is moved in the cylinder until the air column in the latter is in resonance with the sound from the machine.—Page 948.

* * *

If gates on molds are too large, the pouring gate cannot be kept filled during pouring. This permits impurities to enter the mold. Accordingly, it is wise to choke the flow somewhere between the ladle and the mold.—Page 944.

* * *

Suggests how a low-cost rustless steel may be made. A low-chromium steel, containing about 0.50 per cent copper, can be made in open-hearth furnaces, says metallurgist. It would occupy a position between stainless iron and plain copper-bearing steels or ingot iron.—Page 954.

* * *

Water-quenching of silicon steels produces superior physical qualities. If the steel is alloyed with 1 per cent chromium, about the same results are obtained from oil-quenching as from water-quenching.—Page 957.

* * *

Hardens high-speed steel tools in salt bath at 2400 deg. Fahr. without injury to the tools or furnace. New process is claimed to be fumeless and low in cost.—Page 956.

* * *

Alloy steel spring failures found to be due to slag inclusions. Engine builders have eliminated spring failures by using springs of high-carbon piano-wire steel.—Page 958.

In lapping gears the abrasive should be selected for the softest gear in the pair or train. Otherwise the soft gear will be harmed. No one abrasive is suitable for more than a few types of gears, says abrasive manufacturer.—Page 949.

* * *

True criterion of the transverse strength of cast iron is the modulus of rupture determined for the actual bar section, measured at the point of rupture, says British expert. By concentrating on standard bar test, relations between size and strength, and composition and strength, may be determined.—Page 952.

* * *

Warns against hardening steel too much for the particular type of steel used. If the hardness exceeds what the steel is made for, failure in service may result, metallurgist declares.—Page 959.

* * *

Doctor Haney looks for higher pig iron prices and lower scrap prices. "Further advances in pig iron prices seem to be a reasonable expectation during the next two or three months," says forecaster. "It seems probable that the scrap markets are near their peak and that considerable declines will occur before the end of the year."—Page 966.

* * *

United States is a more important factor in steel export market than statistics indicate. Though our steel exports are exceeded by those of four European countries, a great part of their business is among themselves, while virtually all of our steel exports go to non-European areas.—Page 947.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

ESTABLISHED 1855

Cutting Harder and Faster

PROBABLY the most important feature of Metal Week in Philadelphia was the disclosure of a new tool substance and its demonstration at the Commercial Museum. Rumors of a super-hard material used abroad for drawing dies had been coming over for several years. Returning visitors from the Krupp plant had reported seeing some super high-speed steels in action; it was said that these materials were made of metallic carbides cemented together with less brittle materials. American metallurgists turned their attention to these possibilities. Yet all the time, in the words of H. J. French of the Bureau of Standards, the machine tool users were like beggars looking into a restaurant window—a most desirable material was dangled before their eyes with no possibility of getting any.

Now comes Dr. Samuel L. Hoyt of the General Electric research laboratory, and describes a substance to be marketed under the name of carboloy, which, in view of his modest presentation of facts, constitutes the greatest single advance in the art of cutting metals since the announcement of the Taylor-White method of heat treating tool steels. One important distinction needs to be made. The high-speed steel was an important advance over the carbon tool and the air-hardening tool because it cut mild steel six or eight times as fast. But it is not essentially a hard substance, nor did it prove to be useful on material which could not satisfactorily be cut at a slower rate by the old tools.

This recently invented combination of tungsten carbide and cobalt is intrinsically hard—three times as hard as the old tools—and not only appears to be able to stand against steel satisfactorily at largely increased speeds, but also can cut tough or abrasive materials (like aluminum bronze, manganese steel castings, chilled iron, bakelite and carbon products) which hitherto have worn down the cutting edge of the best tools in short order. In fact, we are informed that the General Electric Co. is using many of the new tools in production on insulating materials, not previously machinable.

It is interesting to remember the chemical relationships of our tools. Carbon tools owe their hardness to their content of iron carbide; the cementing material is the soft iron, ferrite (but according to Jeffries and Archer's theory, hardened because of its excessively fine grain after quenching). After 1870 it became generally known that tungsten and chromium combined with high-carbon steel slowed down the softening reactions, so a drastic quenching would be unnecessary. Tungsten, chromium and iron carbides thus combined to make a steel which was hard after slow cooling. So-called Mushet steels were used

on hard castings, although they satisfactorily run on steel twice as fast as the carbon tools.

The third era in tool steels dates from 1900 when Taylor and White disclosed the fact that, if these air-hardening tungsten-chromium steels were cooled from a sweating temperature and given a high draw, they would retain their hardness up to a red heat. Consequently another doubling of machine speeds was possible because friction from the chip which would temper the older tools had no effect on the newer high-speed steels.

A fourth doubling in cutting speed came a few years later when the optimum composition in tungsten, chromium, carbon and vanadium was worked out—a problem which Dr. J. A. Mathews did much to clarify. In all this half century of advance, it can be seen that the revolution in machine shop practice was primarily due to the hardening and stabilizing effect of tungsten, chromium and iron carbides in the complex tool steel. More recently the addition of cobalt in amounts up to 15 per cent has been found to increase the cutting speed of some tools even further and to give a more durable cutting edge at a red heat.

Meanwhile Haynes had discovered stellite, a family of alloys essentially of tungsten, chromium and cobalt, intrinsically hard and requiring no heat treatment. This soon established itself for machining hard cast iron ("semi-steel") and for rough turning medium steels. The new German die alloys, described in *THE IRON AGE* of Aug. 16, seem to be of this general class. But this swing to hard metals seems to be a passing phase. The new tool material described by Doctor Hoyt again comes back to a hard carbide of tungsten with softer cobalt metal as a binder. Tungsten, chromium, cobalt—metals and carbides—are the leading actors in this metallurgical pageant.

About all that can be said at this date, is that the new tool materials open up a wide vista of possibilities. That they will meet some impediments (such as cost, brittleness and competitive exploitations) cannot be doubted. It is too much to expect that they will render obsolete all our present practice; but that they will have a profound influence on numerous aspects of machine shop operation cannot be doubted.

Winning the Fight on Corrosion

NONE who heard the papers on stainless iron at the steel treaters' meeting in Philadelphia last week, or listened to the summary of the advances in chromium steels and irons given by Dr. F. M. Becket at the Institute of Metals dinner, could fail to appreciate that excellent progress has been made. Many grades of rustless iron and of the higher chromium alloys have been perfected and are in use in a widening range of industries.

One company has been producing nitric acid on a large scale by the fixation of atmospheric nitrogen since it was found that rustless iron was adaptable to the process. About 1200 tons of the alloy at a cost of nearly \$1,500,000 is now employed or on order for this purpose. Ultimate independence of the Chilean nitrate fields thus becomes a possibility. In the oil industry these alloys have revolutionized processes and made possible larger yields of gasoline for the automotive industry. Here the demand for non-oxidizing, strong metal that shall maintain these properties under high temperatures seems to have been met.

The battle against corrosion has been long and hard fought. For years theories of its operation have been controverted and many methods of combatting it have had and are still having their day. Meanwhile, steel replacement on a large scale, prodigal as that waste has been, still holds the preponderance in the economic argument, so costly is any metal that can guarantee immunity. Yet all signs indicate steady progress on the commercial as well as the metallurgical side of the problem.

Lessons from the Scrap Rise

THE rise in steel scrap prices in the last few months suggests that the mills return to the carrying of stocks—a policy from which they departed only recently. Heavy melting steel scrap has advanced \$4 a ton in the Pittsburgh district, \$3 in eastern Pennsylvania and about \$2 at Chicago. Such an advance was quite unexpected and has attracted much attention. It may be argued that at the new levels scrap has merely approached its “intrinsic” value, relative to pig iron; but if so it was previously much too low. The point is that in an era of relatively steady commodity prices all around such swings seem out of keeping.

The mechanism of the scrap market has changed altogether in recent years from that of pre-war time. Then there were two classes of swings, a seasonal swing with the low falling commonly about the middle of the year, and a swing in keeping with the longer term swings in steel activity and finished steel prices. It will no doubt be recalled that steel prices used to indulge in general and marked swings.

Under the old conditions the dealers took care of the matter of supplies. Having in mind what seemed to be the normal seasonal swing, and being able more or less to foresee the longer term swings, they accumulated yard stocks after prices had had some considerable fall, feeding them out after there had been some substantial advance. Freights were lower then, and a total swing of \$4 a ton in the market was sufficient to give the dealers a good trading basis. Some of the swings were greater than that, but they were not out of line, as finished steel prices also had their swings.

It is quite clear that the outcome of scrap, from original sources, does not fluctuate with the varying needs of the steel mills, either in point of time or point of volume; hence the need of a reservoir or receiver somewhere. When the mills are increasing their operating rate they need particularly large quantities of outside scrap, since it takes time for their supplies of works scrap to increase. Later on, as the increased steel production comes to be used, the supply of industrial scrap increases. When the rate of steel produc-

tion is decreasing the mills still have their works scrap and require correspondingly less from outside, while industrial scrap continues to pour into the situation.

In short, the natural outcome of scrap varies at exactly the wrong time. Its swings are always too late for mill convenience. Dealers are unable to operate along the line of accumulating scrap at one time and feeding it out at another, as they used to do. For one thing, freights and cost of handling are much higher. For another thing, mills are so particular about their costs that they would hesitate to pay advanced prices when dealers' yard stocks were visible, and finally there is keen and relentless competition between dealers. Many dealers have disappeared in the last few years, having lost all they had or all they cared to lose.

It would seem clear that when the dealers are unable to carry stocks the mills should do so, and naturally there should be more resort to duplexing, a process not so much in vogue recently, while it used to be a great aid in smoothing things out. Thus in 1914 only 3.7 per cent of the total ingot production came from duplexing while in 1916 the proportion was 8.3 per cent. Then again in 1920 the proportion was 8.0 per cent and in 1921 it was only 4.4 per cent, while the actual tonnage of duplex ingots was only one-fourth that of 1920.

Self-Interest in the Public Interest

“AMERICAN industry faces no more important task today than that of protecting the buying power represented by wages.” This expression by Eugene G. Grace, president of the Bethlehem Steel Corporation, is the accepted opinion of most industrial executives today. But when we compare it with the view that prevailed less than a generation ago, such recognition of the dependence of prosperity upon high buying power of wage earners is seen as a virtual revolution in economic thought.

Not so many years back there was agitation against “predatory wealth” and “special interests” on the ground that the building up of large fortunes was at the expense of the public and against the general welfare. This unrest had some basis in the unenlightened selfishness of certain of the earlier leaders in industry. The millennium has not come in, but a marked change has taken place in the common conception of self interest. Management no longer looks upon high prices and low wages as the twin prerequisites of profits. The consumer no longer fears extortion at the hands of industry. Nor does labor now believe that its bargaining power is its sole guaranty of a fair wage. And little is now heard of an essential and irrepressible conflict between employer and employee or between producer and consumer.

Mechanization of industry is yielding economies that cannot be converted into profits without a large volume of business, and volume is impossible unless buying power is high and widely diffused. Protection of the buying power of wages is of general concern. Management must find still more ways of increasing efficiency; labor must whole-heartedly support these innovations. That view is now widely held and will doubtless find its way in time to the less progressive branches of industry where old antagonisms and old issues persist. The partnership of employer and employee on the one hand, and of producer and consumer on the other, is

based on realities; in fact, it conditions the continuance of national prosperity.

More Work, Less Fuel

PRELIMINARY estimates of this year's production of coal, petroleum and natural gas indicate a decrease from last year of 4 or 5 per cent, when the fuels are brought together on a heat unit basis. Yet there is no doubt that more work is being done this year than last. Even in a single year we seem to have made distinct progress in getting more results from our fuels.

From the viewpoint of the fuel producing industries the trend has been very unsatisfactory. The forecast here made involves estimates of changes in production from 1927 to 1928 as follows: Bituminous coal, 6 per cent decrease; anthracite, 9 per cent decrease; petroleum, an even break or a slight increase; natural gas, about 7 per cent increase.

Of course, the coal industry does not complain of its poor production, for it is always feeling that production runs too heavy. What it does complain of is the poor demand. The oil industry on the other hand has to submit to its production, which it considers altogether too high. When it comes to natural gas there is another situation. Little complaint is made of production or demand. Natural gas has been awaiting a

greater outlet through the construction of pipe lines, the Pan Handle field of Texas and the Monroe field of Louisiana having much gas held back awaiting lines to markets, some of which are now being built. Our estimate of 7 per cent increase in natural gas production is merely a projection of the rate of increase in the two preceding years. There are no current reports on gas production as in the case of both coal and petroleum. Next year promises a large increase in natural gas which, as indicated, is largely a matter of ability to reach markets.

Both petroleum and natural gas this year attain new high percentages of the total fuel production, when figured on a heat unit basis, through the influence of a decrease in coal and, in the case of natural gas, an increase in its production. On a heat unit basis the fuels run this year approximately as follows: Bituminous coal, 63 per cent; anthracite, 9 per cent; petroleum, 21 per cent; natural gas, 7 per cent.

In later years we are quite likely to see the natural gas percentage increase, for a long life is promised for the fields. In petroleum the talk is of relatively early exhaustion, but we have now had that talk for so many years that many will doubt. Economies in the use of fuel promise to continue, as best practice of one time extends to the average while itself improving. Over a period of years coal production is likely to have little if any increase.

To Legalize Resale Price Contracts

Advocates of Kelly-Capper Bill Hold That It Will Aid
Smaller Manufacturers and Independent Dealers
and Still Preserve Competition

WASHINGTON, Oct. 16.—Again an effort will be made at the forthcoming session of Congress to pass a bill legalizing the maintenance of resale prices. Representative Kelly of Pennsylvania and Senator Capper of Kansas, authors of an identical measure now pending and known as the Kelly-Capper price standardization bill, say that it will be passed at the next session. On the other hand the general view is that, as with similar proposed legislation in the past decade, it will be defeated.

Price Stabilization the Aim

Proponents of the bill point out that extensive hearings on the subject, as well as public discussion, have dispelled the once popular idea that it entails price fixing and instead have shown that it means price stabilization, elimination of price cutting, and protection against inferior products. On these grounds it is argued that such a law would be to the advantage of the manufacturer, distributor and consumer. Its supporters point to the fact that a favorable report on the Kelly-Capper bill was made to the House Committee on Interstate and Foreign Commerce by a subcommittee of that body at the last session of Congress. They also expect that the inquiry now being made on the subject by the Federal Trade Commission will disclose a favorable attitude on resale price maintenance. The commission will make its report to Congress early in December.

Opponents of the bill contend as heretofore that it affords opportunity for manufacturers and distributors to gain advantages at the expense of consumers and therefore that it is not in the public interest.

The legislation covers only trade-marked or branded ar-

ticles, or so-called standard merchandise. In making its favorable report, the subcommittee of the House Committee on Interstate and Foreign Commerce presented an amendment to the bill which permits disposal of stock without regard to agreed prices, when the owner discontinues dealing in such commodities as are covered by the bill, and gives like exemption to dealers when disposing, toward the end of a season, of a surplus stock of goods especially adapted to that season.

Competition Not Eliminated

It is argued for the bill that the public would not suffer by any undue increase in price, because the measure specifically provides that any contract between maker and seller must relate only to an article which is in fair and open competition with commodities of the same general class produced by others. The point is also made that it is now generally accepted that a large volume of sales at a small profit is better than a small volume at a large profit and that if any producer of trade-marked articles unduly increases his price his competitors are sure to invade his market with lower prices.

In these days of mail orders and chain stores, it is urged, it is certain that these aggregations, in case they do not get fair prices from manufacturers of standard articles, will have the desired articles specially made for them and will sell them at much lower prices. Testimony is said to show that local dealers suffer destructive competition from these chain stores and other large distributors with great capital, who, it is alleged, offer standard goods of nationally advertised brands at prices which represent cost, or in some

cases less than cost. They are said to do this for the purpose of attracting customers, making up their loss on a standard article by greater profits on staple goods on which there are no standard or advertised prices. Such a practice, it is contended, not only works to the detriment of a local dealer but also interferes with, if it does not destroy, the business of the manufacturer of such standard articles in the particular town affected. Such methods force the independent dealer to take these goods out of stock, leaving their sale to chain stores which, it is claimed, can dictate to the manufacturer the price at which they will purchase his goods.

Tendency to Gradual Price Reduction

Makers of standard trade-marked goods, it is pointed out, have to rely primarily on quality for a large and continuous demand on the part of the public, but with unfair competition there is a strong pressure on the manufacturer to make his goods for a price and not primarily for quality. On the other hand, it is contended, if the dealers in standard trade-marked articles buy them under proper resale price agreements the quantities of these articles handled in

the aggregate would be so increased, both because of public demand and because the dealers will be anxious to handle them at a fair profit, that the quantity production will of itself cause a gradual reduction in cost and also in price.

The further point is made that large manufacturers are now able to maintain fair control of retail prices, while smaller manufacturers have not the resources to protect themselves against destructive practices.

Representative Lea, in a dissenting report, said that he was reluctant to interfere with the right of a buyer of property to dispose of it on any terms satisfactory to himself. He considered that the public is not interested in merely protecting profits or permitting an arrangement that arbitrarily fixes profits. Competition without misrepresentation, on a close margin, is not against public interest. Representative Lea said he could not join in the majority report unless the protection of a contract was so limited as to confine it either to costs or a moderate percentage above the purchase price of the dealer, which he fixed at 10 or 20 per cent. Such a margin, he held, would prevent sales below cost and not be open to the criticism of fostering unreasonable profits.

CORRESPONDENCE

The Chance of the Small Manufacturer

To the Editor: As a long-time reader of THE IRON AGE from cover to cover, I was much impressed by your editorial "Cheapness at a Price," appearing in your Oct. 11 issue. The facts summarized there merit the serious attention of the small manufacturer, but I do not believe he need become pessimistic in view of this editorial.

Whether we wish it or not, larger and larger corporations with their obvious economies have come to stay and if the smaller manufacturer seeks to compete with them on their own ground he is doomed to failure. The advantages, however, of the larger corporation hold only within certain bounds, and the determination of those limits is one of the serious problems of the small manufacturer. Once outside the bounds wherein lie larger purchasing power, greater mass production, greater resources for wide distribution, and the advantages of superior technical leadership, the small manufacturer can meet the large corporation at even or perhaps better terms. Once outside of those limits, the advantages of the small manufacturer are far too numerous to detail here, but that they exist is proved by the large percentage of the country's business that is still done by the smaller firm.

One particular advantage is in the specialty field. Mass production plus mass distribution requires a standardization of products which makes it very costly for the large corporation to make and sell non-standard or specialty material. Some specialties are so limited that it is hardly worth while to go into them. On the other hand, many specialties are destined to great growth; in fact, it might be said that the specialty of today becomes a standard product tomorrow. The small manufacturer exploiting such a specialty and growing with it will become the large manufacturer of tomorrow.

It seems odd, perhaps, for us to think of steel as a specialty; and yet, when the Bessemer was first introduced iron was the standard mass product and the pitiful output of the first Bessemer was a specialty which it was conceded might have some future in the manufacture of steel rails; but as for general use—well, that was another matter. And now look at the beast. It has grown to the point at which not only has steel manufacture become a standard mass

production, but many steel specialties have grown to the standard status. We can all remember that but a few decades have passed since these specialties were born—the automobile, the radio, the talking machine, the airplane, the skeleton steel building.

The smaller manufacturer can stay in business by developing a specialty, preferably one protected by patent or other method of whole or part monopoly. If he picks the right specialty now, there is nothing to prevent his becoming a large operator later on.

CROSBY FIELD.

Brooklyn, N. Y., Oct. 15.

Rapid Corrosion Tests for Coated Steel

Investigation by the Bureau of Standards, Department of Commerce, indicates that, in the case of zinc-coated steel, the bureau's simulated atmospheric corrosion tests produce an effect that more closely resembles corrosion in service than the spray test.

Since it is important to develop a test that will give some indication of the probable life of the product, the bureau has made a thorough study of the two test procedures now in use. The simulated atmospheric corrosion test employs a moist gaseous mixture of sulphur dioxide, carbon dioxide and air, while the spray test uses normal solutions of sodium chloride or ammonium chloride. The time required for breaking down the zinc coating was considerably less with the first test than with the second, and the coating was broken down in a more consistent manner.

No attempt was made to interpret the experimental results in terms of service life under the many atmospheric conditions that are found in different climates. Any satisfactory attempt at such an evaluation must await the results of long-time field tests on zinc-coated products, conducted under typical conditions obtaining at different locations. A complete account of this work is given in Research Paper No. 10 of the Bureau of Standards.

The "Blaster's Handbook," issued by the Explosives Department of the E. I. du Pont de Nemours & Co., Wilmington, Del., has been revised. New matter includes a description of the character and uses of pellet powder, a relatively new type of explosive in the United States for use in coal mines. Sections are devoted to ore mining, coal mining and tunneling revised as to new practices.

Iron and Steel Markets

Prices Show Further Strength

Heavy Rolled Products \$1 to \$2 a Ton Higher on Prompt
Tonnages—Advances in Scrap, Coke and Pig Iron—
Demand for Automobile Steel Dips

FOLLOWING the heavy bookings of recent weeks, new business in steel is at a reduced rate, but the upward movement of prices has not yet run its course.

Further evidences of strength in finished steel, in some instances attributable to extended deliveries, are matched by additional advances in scrap and pig iron and a slight rise in blast furnace coke.

Steel production holds at close to 90 per cent of ingot capacity, and little, if any, recession from that rate is looked for this month. With mill backlogs large and consumer commitments of like proportions, the decline in new orders is not surprising. The view is still held that the rush of business in September was partly due to the advanced prices named for fourth quarter and that consumers' reserve stocks have been built up to some extent.

On the other hand, pressure for deliveries is still insistent, and the leading producer of sheets is operating several plants an extra turn each week to speed up shipments.

Not a few consumers who failed to anticipate their needs are embarrassed by the heavy commitments of the mills on some products. Their pressure for prompt material, although usually in small tonnages, has resulted in a further strengthening of prices on the heavy rolled products. Bars, and in less degree plates and shapes, are commanding \$1 to \$2 a ton more than the prices at which fourth quarter contracts were closed.

An advance of \$2 a ton on cold-rolled strips to 2.85c. a lb., Cleveland or Pittsburgh, is being widely adopted. Order books are reported to be the largest in over three years.

Pressure on the mills is not uniformly strong throughout the country. A decline in specifications at Chicago is ascribed largely to slackening operations in the automobile industry. Chicago steel output is still at a rate exceeding 85 per cent, and mill operations in other producing centers dependent on motor car steel have not yet been affected. A number of automobile manufacturers will shut down two or three weeks in November for inventories, and their steel requirements upon resuming operations will depend on the motor car demand at that time. Purchases by the Chevrolet company, which will start production on new models next month, are expected to offset the decline in orders from other plants.

Steel production has been reduced in the Birmingham district, where five open-hearth furnaces were put out following the shutting down of the Ensley rail mill.

This action is of temporary significance, marking the completion of 1928 orders. The rail buying movement for 1929 has been under way for several weeks. Following closely the purchase of 46,622 tons by the Erie a week ago, the Santa Fe has distributed orders for 119,637 tons. In addition, the Reading will divide 30,000 tons between a Pittsburgh and an Eastern mill. New inquiries include 190,000 tons for the New York Central and 30,000 tons for the Texas & Pacific.

Farm implement plants are taking steel at an undiminished rate, and shipments to them so far this year have been the largest in history.

Unfilled orders of pipe mills are being slowly reduced. While demands from the oil and gas industry have declined, a projected natural gas line from Ventura, Cal., to San Francisco will call for 50,000 tons of steel.

Basic pig iron in eastern Pennsylvania has advanced 75c. a ton on purchases of 5000 tons. An inquiry in that district for 20,000 tons of basic iron is from a steel producer that bought 25,000 tons 30 days ago. Prices are also stronger in foundry grades in the Central West, where Lake furnaces have booked some first quarter business. A Valley producer of low phosphorus has announced an advance of 50c. a ton to \$27, furnace.

Heavy melting steel scrap has advanced another 25c. a ton at Pittsburgh and St. Louis and \$1 a ton at Detroit.

Spot furnace coke, under the influence of orders from blast furnaces supplementing contracts, has advanced 10c. to \$2.85 a ton, Connellsville.

The new card of extras on hot-rolled strip recently announced by an Ohio mill has been adopted by a number of producers, although others may decide to quote two base prices instead of only one.

Tin plate prices for the first half of 1929 will probably be announced in the next 30 days. A cut in the cash discount from 2 per cent to 1/2 per cent is also expected.

In Europe a changing situation is indicated. A diminishing steel demand, exports included, now is reported, accompanied by some price recessions.

Both of THE IRON AGE composite prices remain unchanged. That for pig iron, at \$17.84 a ton, is exactly the same as a year ago. The finished steel composite, at 2.362c. a lb., compares with 2.307c. twelve months ago.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At Date, One Week, One Month, and One Year Previous

Pig Iron, Per Gross Ton:	Oct. 16, 1928	Oct. 9, 1928	Sept. 18, 1928	Oct. 18, 1927
No. 2 foundry, Philadelphia...	\$20.76	\$20.76	\$20.76	\$19.76
No. 2, Valley furnace.....	17.00	17.00	17.00	17.50
No. 2, Southern, Cin'ti.....	19.94	19.94	19.94	20.94
No. 2, Birmingham.....	16.25	16.25	16.25	17.25
No. 2 foundry, Chicago*.....	18.50	18.50	18.50	18.50
Basic, del'd eastern Pa.....	19.75	19.00	19.00	20.00
Basic, Valley furnace.....	17.00	17.00	16.25	17.00
Valley Bessemer, del'd P'gh..	19.26	19.26	19.01	19.76
Malleable, Chicago*.....	18.50	18.50	18.50	18.50
Malleable, Valley.....	17.50	17.50	17.25	17.50
Gray forge, Pittsburgh.....	18.26	18.26	18.26	18.76
L. S. charcoal, Chicago.....	27.04	27.04	27.04	27.04
Ferromanganese, furnace.....	105.00	105.00	105.00	90.00

Rails, Billets, Etc., Per Gross Ton:

O.-h. rails, heavy, at mill....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Bess. billets, Pittsburgh.....	33.00	33.00	32.00	33.00
O.-h. billets, Pittsburgh.....	33.00	33.00	32.00	33.00
O.-h. sheet bars, P'gh.....	33.00	33.00	32.00	34.00
Forging billets, P'gh.....	38.00	38.00	38.00	38.00
O.-h. billets, Phila.....	37.30	37.30	37.30	38.30
Wire rods, Pittsburgh.....	42.00	42.00	42.00	43.00
Skelp, grvd. steel, P'gh, lb....	1.90	1.90	1.90	1.75

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia.....	2.12	2.12	2.12	2.07
Iron bars, Chicago.....	2.00	2.00	2.00	1.85
Steel bars, Pittsburgh.....	1.90	1.90	1.90	1.75
Steel bars, Chicago.....	2.00	2.00	2.00	1.85
Steel bars, New York.....	2.24	2.24	2.24	2.09
Tank plates, Pittsburgh.....	1.90	1.90	1.90	1.75
Tank plates, Chicago.....	2.00	2.00	2.00	1.85
Tank plates, New York.....	2.22½	2.22½	2.17½	2.09
Beams, Pittsburgh.....	1.90	1.90	1.90	1.75
Beams, Chicago.....	2.00	2.00	2.00	1.85
Beams, New York.....	2.19½	2.19½	2.14½	2.09
Steel hoops, Pittsburgh.....	2.20	2.20	2.20	2.30

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Sheets, Nails and Wire,

Per Lb. to Large Buyers:	Oct. 16, 1928	Oct. 9, 1928	Sept. 18, 1928	Oct. 18, 1927
Sheets, black, No. 24, P'gh....	2.75	2.75	2.65	2.90
Sheets, black, No. 24, Chicago	2.85	2.75	2.75	3.00
dist. mill.....	3.50	3.50	3.40	3.75
Sheets, galv., No. 24, P'gh....	3.60	3.60	3.60	3.80
Sheets, galv., No. 24, Chicago	2.00	2.00	2.00	2.15
dist. mill.....	2.10	2.10	2.10	2.30
Wire nails, Pittsburgh.....	2.55	2.55	2.55	2.55
Wire nails, Chicago dist. mill..	2.60	2.60	2.60	2.60
Plain wire, Pittsburgh.....	2.40	2.40	2.40	2.40
Plain wire, Chicago dist. mill..	2.45	2.45	2.45	2.45
Barbed wire, galv., Pittsburgh	3.20	3.20	3.20	3.25
Barbed wire, galv., Chicago dist.	3.25	3.25	3.25	3.30
mill.....	\$5.25	\$5.25	\$5.25	\$5.50
Tin plate, 100 lb. box, P'gh....				

Old Material, Per Gross Ton:

Heavy melting steel, P'gh....	\$17.75	\$17.50	\$16.75	\$14.50
Heavy melting steel, Phila....	16.00	16.00	15.50	14.00
Heavy melting steel, Ch'go....	14.00	14.00	13.00	11.50
Carwheels, Chicago.....	13.75	13.75	13.50	13.50
Carwheels, Philadelphia.....	16.50	16.50	16.00	15.50
No. 1 cast, Pittsburgh.....	15.50	15.00	15.00	14.75
No. 1 cast, Philadelphia.....	17.00	17.00	16.50	16.50
No. 1 cast, Ch'go (net ton)....	15.50	15.50	15.00	14.00
No. 1 RR. wrot., Phila.....	15.50	15.50	15.00	15.50
No. 1 RR. wrot., Ch'go (net)...	12.75	12.75	12.00	10.00

Coke, Connellsville, Per Net Ton at Ovens:

Furnace coke, prompt.....	\$2.85	\$2.75	\$2.75	\$2.85
Foundry coke, prompt.....	3.75	3.75	3.75	4.00

Metals,

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	15.25	15.25	15.00	13.25
Electrolytic copper, refinery..	15.00	15.00	14.75	13.00
Zinc, St. Louis.....	6.25	6.25	6.25	6.05
Zinc, New York.....	6.60	6.60	6.60	6.40
Lead, St. Louis.....	6.32½	6.32½	6.32½	6.05
Lead, New York.....	6.50	6.50	6.50	6.25
Tin (Straits), New York.....	48.75	48.50	48.00	58.62½
Antimony (Asiatic), N. Y.....	11.00	11.50	10.87½	11.25

Pittsburgh

Steel Orders Lighter, But Continued High Production Is Assured Through October at Least

PITTSBURGH, Oct. 16.—Steel plant engagement in this and nearby districts still is averaging 90 per cent of capacity. There is no indication of a recession this month from that rate. While the amount of business entered on mill books in the past week has been less than in the first week of October, this appears to be largely in line with expectations after the heavy flood of orders and specifications in the latter part of last month.

Aside from wire, tin plate and pipe mills, there are commitments sufficient to provide full occupation of rolling capacity for the month. Lighter new purchases, however, suggest that the mills will cut extensively into order books at the present rate of activity. Whether a 90 per cent production of ingots can be maintained beyond this month will depend on the volume of business a few weeks hence.

Rail tonnage is reaching the mills in good volume, but against that are definite signs of some letdown in automobile production. There is sustained demand for steel for building and construction and for agricultural implements. The demands of the oil and gas industry are smaller than they were recently, and, except for seamless pipe and line pipe, orders from that source have not been as large as usual at any time this year.

Of interest in connection with speculation as to the continuance of present steel works operations, is the way scrap dealers are combing the field for ideas upon which to plot their course. As much as \$18 has been paid by consumers for heavy melting steel scrap; there is no admission that more has been paid, but at one point, at least, in this district a dealer is bidding \$18.25 for that grade. Higher prices are predicted in the event that

steel ingot production holds at its present gait for another 30 days. Makers of pig iron also expect to get higher prices on the same premise, it being figured that there will be purchases of scrap by all steel makers if the demand for finished steel holds up and of pig iron by some ordinarily self-contained units.

Close observers of market conditions, however, are looking for some letdown before another month passes, and it is interesting in that connection that a steel company which recently considered putting on another blast furnace finally decided against doing so.

Steel prices are holding steadily. On new business a tendency to seek what is regarded as the top of the market is rather common. Several mills want 2c., base, on new business in bars. Some makers of cold-rolled strips ask 2.85c., base Pittsburgh, on fresh business. The market under present conditions, with makers well supplied with tonnage and consumers well protected on probable requirements, is free from either pressure for business on the part of producers or pressure on prices by consumers.

Pig Iron.—The market still is firm, but, so far as open transactions go, it is very quiet. Private negotiations are understood to be in progress for a considerable tonnage of basic iron, most of which is for delivery in the first quarter of 1929. The American Steel Foundries is in the market for 3000 to 5000 tons of this grade for its Alliance, Ohio, works. A sale of 2500 tons of basic is noted at \$17, f.o.b. a Pittsburgh district furnace. Valley furnaces which have basic iron for sale want \$17, furnace, for it. A company which recently had requirements of a pressing character appears to have picked up a sufficient supply to tide it over the emergency. Foundry iron is moving well on old orders, but new business does not amount to much. An effort to stiffen the price of this grade 50c. a ton to \$17.50, Valley furnace, has not made much progress. A few moderate-sized lots of Bessemer and malleable iron are being sold. The Valley producer of low phosphorus iron has gone to \$27, furnace, for that grade. Otherwise, Valley prices are unchanged.

Prices per gross ton, f.o.b. Valley furnace:

Basic	\$17.00
Bessemer	17.50
Gray forge	16.50
No. 2 foundry	17.00
No. 3 foundry	16.50
Malleable	17.50
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Fluorspar.—It is reported that some makers have advanced their prices to \$18, f.o.b. mines, for gravel spar analyzing 85 per cent calcium fluoride and not over 5 per cent silica. The most recent sale in this district was of 500 tons at \$17, mines. Consumption has risen in keeping with steel works operations and it is said that accumulations at the mines have been pretty well cleaned up. In the meantime, there has been no increase in production on account of the fact that recent prices have been unprofitable.

Semi-Finished Steel.—The market has settled to a basis of \$33, Pittsburgh or Youngstown, for sheet bars and base billets and slabs, with an extra of \$1 a ton for billets and slabs

less than 4 x 4 in. in area. Most non-integrated sheet, tin plate and strip makers have signed fourth quarter contracts at these prices, which, in the case of billets and slabs, are \$1 a ton less than makers set out to obtain. Finishing mills, for the most part, are working on steel bought at third quarter prices. Wire rods are firm at \$42, base Pittsburgh and Cleveland, and are moving steadily.

Bars, Plates and Shapes.—Makers generally find the past week to have been productive of smaller entries on their books than the first week of the month, but the first week included a good deal of third quarter tonnage, specifications for which did not reach mills until after the end of that quarter. Business still is regarded as good, considering the flood of orders and specifications during the latter part of last month, and all mills are booked to the end of the month and some beyond, notably on bars. The market is very firm, and makers are inclined to view 1.90c., base, at which large consumers were covered for this quarter, a matter of history; they are quoting \$1 to \$2 a ton more on current inquiries.

Rails and Track Supplies.—The Carnegie Steel Co. has been awarded 40,000 tons of the 76,000 tons of standard-section rails placed by the Erie and Reading railroads. Distribution of the Pennsylvania and New York Central rail requirements is expected shortly. Some good-sized orders for track accessories are in the offing, but current orders are light. Prices are unchanged.

Wire Products.—Business is fairly good on the whole, but provides no tax on productive capacity. The chief satisfaction of manufacturers is that prices are holding well.

Tubular Goods.—A gas line of 240 miles of 18-in. or 20-in. pipe to run from southern California to San Francisco is the most promising piece of business in this class now before makers. Old orders are slowly playing out. Business still is fairly active in seamless oil country pipe, but only moderately good in butt welded and lap welded pipe. Highest rate of en-

agement among pipe mills is in seamless pipe-making capacity. In tubing, the best demand still comes from motor car builders.

Sheets.—Business on makers' books still is sufficient to sustain almost full mill operations. There are relatively few idle mills. At several plants of the American Sheet & Tin Plate Co. an extra turn each week is found necessary to make the shipments that consumers are demanding. The common finishes of sheets are firm at the prices asked for this quarter, but some buyers are said to have quotations lower than 3.50c., base, on galvanized sheets. Mills appear to be holding rigidly to the lower cash discount for cash, which became effective Oct. 1.

Tin Plate.—Demand for tin plate for packers' cans has been satisfied for this season, and mill operations are chiefly sustained by general line tin plate requirements and a fair amount of export business. There has been no rolling against early 1929 packers' can requirements. Prices for the first half of next year will probably be announced in the next 30 days, and with that announcement is expected some word as to the cash discount. It is believed that it will be cut from 2 per cent to one half of 1 per cent, effective from Jan. 1.

Cold-Finished Steel Bars and Shafting.—Reports of some letdown in the productive activities of the motor car industry are not reflected in the shipments of cold-finished steel bars, but specifications for material to be used in cars to be built in late November and early December are in lessened volume. Current shipments, for the most part, carry the third quarter contract price. On fourth quarter contracts, 2.20c., base, has been well established.

Hot-Rolled Flats.—Makers in this district still are being pressed for deliveries on orders for strips, and a full operation of mill capacity is necessary to accommodate the demand. Local producers have done nothing yet in connection with the new card of extras.

THE IRON AGE Composite Prices

Finished Steel

Oct. 16, 1928, 2.362c. a Lb.

One week ago	2.362c.
One month ago	2.348c.
One year ago	2.307c.
10-year pre-war average	1.689c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products constitute 87 per cent of the United States output of finished steel.

	High		Low	
1928	2.364c.	Feb. 14:	2.314c.	Jan. 3
1927	2.453c.	Jan. 4:	2.293c.	Oct. 25
1926	2.453c.	Jan. 5:	2.403c.	May 18
1925	2.560c.	Jan. 6:	2.396c.	Aug. 18
1924	2.789c.	Jan. 15:	2.460c.	Oct. 14
1923	2.824c.	Apr. 24:	2.446c.	Jan. 2

Pig Iron

Oct. 16, 1928, \$17.84 a Gross Ton

One week ago	\$17.84
One month ago	17.63
One year ago	17.84
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High		Low	
1928	\$17.84,	Oct. 2:	\$17.04,	July 24
1927	19.71,	Jan. 4:	17.54,	Nov. 1
1926	21.54,	Jan. 5:	19.46,	July 13
1925	22.50,	Jan. 13:	18.96,	July 7
1924	22.88,	Feb. 26:	19.21,	Nov. 3
1923	30.86,	Mar. 20:	20.77,	Nov. 20

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base Per Lb.
F.o.b. Pittsburgh mill.....	1.90c. to 2.00c.
F.o.b. Chicago.....	2.00c. to 2.10c.
Del'd Philadelphia.....	2.22c. to 2.32c.
Del'd New York.....	2.24c. to 2.34c.
Del'd Cleveland.....	1.92½c. to 2.05c.
F.o.b. Cleveland.....	1.90c. to 2.05c.
F.o.b. Lackawanna.....	2.00c. to 2.10c.
F.o.b. Birmingham.....	2.15c.
C.i.f. Pacific ports.....	2.35c.
F.o.b. San Francisco mills.....	2.35c. to 2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50 and 60-ft. lengths.....	2.00c.
F.o.b. Pittsburgh mills, cut lengths.....	2.25c.
F.o.b. Birmingham.....	2.15c.

Rail Steel

F.o.b. mills east of Chicago dist.....	1.85c.
F.o.b. Chicago Heights mill.....	1.95c.
Common iron, f.o.b. Chicago.....	2.00c. to 2.10c.
Refined iron, f.o.b. P'gh mills.....	2.75c.
Common iron, del'd Philadelphia.....	2.12c.
Common iron, del'd New York.....	2.14c.

Tank Plates

	Base Per Lb.
F.o.b. Pittsburgh mills.....	1.90c. to 2.00c.
F.o.b. Chicago.....	2.00c. to 2.10c.
F.o.b. Birmingham.....	2.15c.
Del'd Cleveland.....	2.09c. to 2.19c.
Del'd Philadelphia.....	2.15c. to 2.25c.
F.o.b. Coatesville.....	2.05c. to 2.15c.
F.o.b. Sparrows Point.....	2.05c. to 2.15c.
F.o.b. Lackawanna.....	2.00c. to 2.10c.
Del'd New York.....	2.22½c. to 2.32½c.
C.i.f. Pacific ports.....	2.20c. to 2.30c.

Structural Shapes

	Base Per Lb.
F.o.b. Pittsburgh mills.....	1.90c. to 2.00c.
F.o.b. Chicago.....	2.00c. to 2.10c.
F.o.b. Birmingham.....	2.15c.
F.o.b. Lackawanna.....	2.00c. to 2.10c.
F.o.b. Bethlehem.....	2.05c. to 2.15c.
Del'd Cleveland.....	2.09c. to 2.19c.
Del'd Philadelphia.....	2.11c. to 2.21c.
Del'd New York.....	2.19½c. to 2.29½c.
C.i.f. Pacific ports.....	2.35c.

Hot-Rolled Flats (Hoops, Bands and Strips)

	Base Per Lb.
Narrower than 3 in., P'gh.....	2.10c. to 2.20c.
From 3 in. to 6 in., P'gh.....	1.85c. to 2.00c.
6 in. and wider, P'gh.....	*1.75c. to 1.90c.
Narrower than 3 in., Chicago.....	2.30c.
From 3 to 6 in., Chicago.....	2.20c.
6 in. and wider, Chicago.....	2.00c.
Cotton ties, f.o.b. Atlantic and Gulf ports:	
Carload per 45-lb. bundle.....	\$1.27
2000 bundle lots.....	1.25
Larger lots.....	1.23

*Mills follow plate or sheet prices according to gage on wider than 12 in.

Cold-Finished Steel

	Base Per Lb.
Bars, f.o.b. Pittsburgh mill.....	2.10c. to 2.20c.
Bars, f.o.b. Chicago.....	2.20c.
Bars, Cleveland.....	2.25c.
Shafting, ground, f.o.b. mill.....	2.55c. to 3.50c.
Strips, P'gh.....	2.75c. to 2.85c.
Strips, Cleveland.....	2.75c. to 2.85c.
Strips, del'd Chicago.....	3.05c. to 3.15c.
Strips, Worcester.....	2.90c. to 3.00c.
Fender stock, Pittsburgh.....	4.25c.

*According to size.

Wire Products

(To jobbers in car lots, f.o.b. Pittsburgh and Cleveland)

	Base Per Keg
Wire nails.....	\$2.55
Galvanized nails.....	4.55
Galvanized staples.....	3.25
Polished staples.....	3.00
Cement coated nails.....	2.55

Base Per 100 Lb.

Bright plain wire, No. 9 gage.....	\$2.40
Annealed fence wire.....	2.55
Spring wire.....	3.40
Galv'd wire, No. 9.....	3.00
Barbed wire, galv'd.....	3.20
Barbed wire, painted.....	2.95

Chicago district mill and delivered Chicago prices are \$1 per ton above the foregoing. Birmingham mill prices \$3 a ton higher; Worcester Mass. (wire) mill \$3 a ton higher on production of that plant; Duluth, Minn., mill \$2 a ton higher; Anderson, Ind., \$1 higher.

Woven Wire Fences

Base to Retailers Per Net Ton

F.o.b. Pittsburgh.....	\$65.00
F.o.b. Cleveland.....	65.00
F.o.b. Anderson, Ind.....	66.00
F.o.b. Chicago district mills.....	67.00
F.o.b. Duluth.....	68.00
F.o.b. Birmingham.....	68.00

Sheets

Blue Annealed

Base Per Lb.

Nos. 9 and 10, f.o.b. P'gh.....	2.00c.
Nos. 9 and 10, f.o.b. Chicago dist.....	2.10c.
Nos. 9 and 10, del'd Cleveland.....	2.19c.
Nos. 9 and 10, del'd Philadelphia.....	2.32c. to 2.42c.
Nos. 9 and 10, f.o.b. Birmingham.....	2.15c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh.....	2.75c.
No. 24, f.o.b. Chicago dist. mill.....	2.85c.
No. 24, del'd Cleveland.....	2.94c.
No. 24, del'd Philadelphia.....	3.07c. to 3.17c.
No. 24, f.o.b. Birmingham.....	2.90c.

Metal Furniture Sheets

No. 24, f.o.b. Pittsburgh, A grade.....	3.85c. to 3.90c.
No. 24, f.o.b. Pittsburgh, B grade.....	3.65c. to 3.70c.

Galvanized

No. 24, f.o.b. Pittsburgh.....	3.50c. to 3.60c.
No. 24, f.o.b. Chicago dist. mill.....	3.60c.
No. 24, del'd Cleveland.....	3.69c.
No. 24, del'd Philadelphia.....	3.82c. to 3.92c.
No. 24, f.o.b. Birmingham.....	3.65c. to 3.70c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh.....	2.90c.
No. 28, f.o.b. Chicago dist. mill.....	3.00c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh.....	4.00c.
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Long Ternes

No. 24, 8-lb. coating, f.o.b. mill primes.....	4.10c.
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Tin Plate

Standard cokes, f.o.b. P'gh district mills.....	\$6.25
Standard cokes, f.o.b. Gary.....	5.35

Terne Plate

(F.o.b. Morgantown or Pittsburgh)

(Per Package, 20 x 28 in.)	
8-lb. coating I.C. \$11.20 25-lb. coating I.C. \$16.70	
15-lb. coating I.C. 14.00 30-lb. coating I.C. 17.75	
20-lb. coating I.C. 15.30 40-lb. coating I.C. 19.85	

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quality Bar Base, 2.75c.

S.A.E. Series Numbers	Alloy Differential	Net Price 100 Lb. Bars
2000 (½% Nickel).....	\$0.25	\$3.00
2100 (1½% Nickel).....	0.55	3.50
2300 (3½% Nickel).....	1.50	4.25
2500 (5% Nickel).....	2.25	5.00
3100 Nickel Chromium.....	0.55	3.50
3200 Nickel Chromium.....	1.35	4.10
3300 Nickel Chromium.....	3.80	6.55
3400 Nickel Chromium.....	3.20	5.95
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum).....	0.50	3.25
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum).....	0.70	3.45
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel).....	1.05	3.80
5100 Chromium Steel (0.60 to 0.90 Chromium).....	0.35	3.10
5100 Chromium Steel (0.80 to 1.10 Chromium).....	0.45	3.20
5100 Chromium Spring Steel.....	0.20	2.95
6100 Chromium Vanadium Bars.....	1.20	3.95
6100 Chromium Vanadium Spring Steel.....	0.95	3.70
9250 Silicon Manganese Spring Steel (flats).....	0.25	3.00
Rounds.....	0.50	3.25
Chromium Nickel Vanadium.....	1.50	4.25
Carbon Vanadium.....	0.95	3.70

Above prices are for hot-rolled steel bars, forging quality. The ordinary differential for cold-drawn bars is 1c. per lb. higher. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis. For billets under 4 x 4 down to and including 2½ in. squares, the price is \$5 a gross ton above the 4 x 4 billet price.

Slabs with sectional area of 16 in. or over carry the billet price; slabs with sectional area of 12 in. to 16 in. carry a \$5 extra above the billet price and slabs with a sectional area under 12 in. carry the bar price.

Band sizes are 40c. per 100 lb. higher.

Rails

Per Gross Ton

Standard, f.o.b. mill.....	\$43.00
Light (from billets), f.o.b. mill.....	36.00
Light (from rail steel), f.o.b. mill.....	34.00
Light (from billets), f.o.b. Ch'go mill.....	36.00

Track Equipment

Base Per 100 Lb.

Spikes, ½ in. and larger.....	\$2.80
Spikes, ½ in. and smaller.....	2.80
Spikes, boat and barge.....	3.00
Tie plates, steel.....	2.15
Angle bars.....	2.75
Track bolts, to steam railroads.....	\$8.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count.....	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld		Iron		Galv.	
Inches	Black	Inches	Black	Inches	Galv.
1½.....	45	1½ to 2.....	+11	+39	
1½ to 2.....	51	2½.....	22	2	
2.....	56	2½ to 3.....	28	11	
2 to 3.....	60	3 to 4.....	30	13	
3 to 4.....	62	4 to 5.....	30	13	
4 to 5.....	62	5 to 6.....	23	7	
5 to 6.....	59	6 to 8.....	26	11	
6 to 8.....	56	8 to 10.....	28	13	
8 to 10.....	64	10 to 12.....	26	11	
10 to 12.....	63				

Lap Weld

2.....	55	43½	23	7
2½ to 6.....	59	47½	26	11
7 and 8.....	56	43½	3 to 6.....	28 13
9 and 10.....	64	42½	7 to 12.....	26 11
11 and 12.....	63	40½		

Butt Weld, extra strong, plain ends

1½.....	41	24½	1½ to 2.....	+19	+54
1½ to 2.....	47	30½	2½.....	21	17
2.....	53	42½	2½ to 3.....	28	12
2 to 3.....	58	47½	3 to 4.....	30	14
3 to 4.....	60	49½			
4 to 5.....	61	50½			

Lap Weld, extra strong, plain ends

2.....	53	42½	2.....	23	9
2½ to 4.....	57	46½	2½ to 4.....	29	15
4½ to 6.....	56	45½	4½ to 6.....	28	14
7 to 8.....	62	39½	7 to 8.....	21	7
9 and 10.....	45	32½	9 to 12.....	16	2
11 and 12.....	44	31½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Lap Welded Steel	Charcoal Iron
2 to 2½ in.....	27
2½ to 3 in.....	37
3 in.....	40
3½ to 4 in.....	42½
4 to 4½ in.....	46
5 to 6 in.....	40

Beyond the above base discounts, the following extra discounts are given:

Lap Weld Steel	Charcoal Iron
Under 5000 lb.....	4 Fives
5000 lb. to 12,000 lb.....	5 Fives
12,000 lb. to 21,000 lb.....	6 Fives
21,000 lb. and over.....	7 Fives

Standard Commercial Seamless Boiler Tubes

Hot Drawn	Charcoal Iron
1 in.....	63
1½ to 1½ in.....	55
1½ in.....	39
2 to 2½ in.....	34
2½ to 3 in.....	42

Hot Rolled

2 and 2½ in.....	40
2½ and 3 in.....	48
3 in.....	54

Less carload, 4 points less. Add 38 per net ton for more than four gages heavier than standard. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage to be held at mechanical tubes list and discount. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Per Cent Off List

Carbon, 0.10% to 0.30%, base (carloads).....	55
Carbon, 0.30% to 0.40%, base.....	50
Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.	

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.60c.
Hoops	4.00c. to 4.50c.
Black sheets (No. 24), 25 or more bundles	3.70c.
Galv. sheets (No. 24), 25 or more bundles	4.55c.
Blue ann'd sheets (No. 10), 1 to 10 sheets	3.35c.
Galv. corrug. sheets (No. 28), per square	\$4.43
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count, 60 per cent off list	
Machine bolts, 100 count, 60 per cent off list	
Carriage bolts, 100 count, 60 per cent off list	
Nuts, all styles, 100 count, 60 per cent off list	
Large rivets, base per 100 lb.	\$3.50
Wire, black soft ann'd, base per 100 lb.	\$3.00 to 3.10
Wire, galv. soft, base per 100 lb.	3.00 to 3.10
Common wire nails, per keg	3.00
Cement coated nails, per keg	3.05

Cold-Rolled Strips.—Recession in automobile production finds no reflection in the insistence of consumers for shipments on their orders. Prices are firm, and, while much tonnage is on makers' books at 2.75c., base Pittsburgh, there is a disposition to quote 2.85c. on new inquiries.

Coke and Coal.—Spot furnace coke is 10c. to 15c. a ton higher as a result of numerous small purchases by furnaces which require supplies in addition to those coming to them on contracts. Lately, it has not been necessary for producers to go under \$2.85 per net ton at ovens to make sales, and some business has been done at a higher price. Spot foundry coke is in good demand and slightly firmer. Warm weather for the time of year has reduced the demand for coal slightly; most of the demand is for prepared sizes for Lake shipment or household use and the supply of

slack, consequently, is so heavy that accumulations are avoided only by sales at very low prices.

Old Material.—The situation in the steel works grades is one of marked firmness. Steel works operations remain high and that means a heavy consumption of scrap and much pressure upon the dealers to deliver on contracts. Mills have gone as high as \$18 for heavy melting steel, and dealers are finding it difficult to pick up tonnages to apply on orders at less than \$17.50. A very strong market in compressed sheets and the railroad specialties exists, partly in sympathy with heavy melting grade. Demand for the specialties is good from the steel foundries.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
Heavy melting steel	\$17.50 to \$18.00
Scrap rails	17.00 to 17.50
Compressed sheet steel	17.00 to 17.50
Bundled sheets, sides and ends	15.50 to 16.00
Cast iron carwheels	15.25 to 15.75
Sheet bar crops, ordinary	17.50 to 18.00
Heavy breakable cast	13.50 to 14.00
No. 2 railroad wrought	17.50 to 18.00
Heavy steel axle turnings	15.00 to 15.50
Machine shop turnings	11.00 to 11.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	18.50 to 19.00
Railr. coil and leaf springs	18.50 to 19.00
Rolled steel wheels	18.50 to 19.00
Low phos. billet and bloom ends	20.00 to 20.50
Low phos. mill plates	18.50 to 19.00
Low phos. light grade	17.50 to 18.00
Low phos. sheet bar crops	18.50 to 19.00
Hvy. steel axle turnings	15.00 to 15.50
Electric Furnace Grades:	
Low phos. punchings	18.50 to 19.00
Hvy. steel axle turnings	15.00 to 15.50
Blast Furnace Grades:	
Short shoveling steel turnings	12.50 to 12.75
Short mixed borings and turnings	12.50 to 12.75
Cast iron borings	12.50 to 12.75
No. 2 bushelling	11.25 to 11.75
Rolling Mill Grades:	
Steel car axles	19.00 to 20.00
No. 1 railroad wrought	13.00 to 13.50
Sheet bar crops	18.00 to 18.50
Cupola Grades:	
No. 1 cast	15.50 to 16.00
Rails 3 ft. and under	18.00 to 18.50

Warehouse Business.—Black and galvanized sheets are quoted higher out of local warehouses. In a large measure, this change is a reflection of the reduction in the cash discount by the mills. Higher mill prices on bars, plates and shapes have not disturbed regular warehouse prices, which were subject to some shading when mill prices were lower. Warehouse business is reported fairly active.

Japan to Get Iron Ore From Australia

WASHINGTON, Oct. 16.—Recently an agreement was entered into by a Japanese organization with a West Australian syndicate for the purchase of iron ore from Yampi Sound, Western Australia, says a report received by the Department of Commerce from Trade Commissioner E. C. Squire, Sydney. Investigations, it is stated, have proved that there are rich deposits of iron ore of good commercial value at Yampi Sound and that they will be developed by a West Australian syndicate, which has obtained British finance. Experts have been sent out to Western Australia by the Asana group of industrial concerns in Japan, and it is added that this organization will enter into a contract to take 150,000 tons of iron ore the first year, 300,000 tons the second year and from 500,000 to 1,000,000 tons thereafter, according to the output. It is understood that the agreement is for 12½ years. The Asana group, it is reported, will spend £10,000,000 in Japan to enable it to treat the Yampi ore.

The Aetna-Standard Engineering Co., Youngstown, has moved to new and larger quarters in the Home Savings & Loan Building, Phelps Street, Youngstown, in which it occupies two full floors. Offices are on the ninth floor and the drafting rooms on the eighth floor.

STEAM piping no less than 7 ft. in diameter has been made at the South Philadelphia works of the Westinghouse Electric & Mfg. Co. It is composed of sections of rolled steel ¾ in. thick which were joined by arc-welding. It is to be installed in a large steam turbine generator unit in an Eastern power plant and is designed to carry 1,600,000 lb. of steam per hr. at 40 lb. absolute pressure.



Chicago

Specifications Lighter, Partly Because of Lessened Needs of Automotive Industry—Ingot Output at 85 Per Cent

CHICAGO, Oct. 16.—Specifications for finished steel products, though still holding at the current rate of shipments and assuring ingot output at a shade better than 85 per cent of capacity, are measurably lighter than a week ago. The downturn in demand is partly due to the slackening pace of the automotive industry. Frame makers have passed the peak of fall production and other parts makers have slowed down in like proportion. Sales, not counting rails, are in fair volume following several weeks of heavy forward buying. Most current purchases are for nearby requirements.

Chicago mills will roll 25,000 tons of standard-section rails for the Santa Fe and they expect to book about 30 per cent of the 190,000 tons to be bought by the New York Central. Recent rail contracts, based on 1929 requirements, have not been scheduled at the mills, but output remains unusually high for this time of the year, being supported by the remainder of old obligations and rather liberal miscellaneous new business for nearby delivery.

Railroad contracting for finished steel is moving forward steadily, one Western road having placed 12,000 to 15,000 tons for shipment in this quarter. The Southern Pacific has ordered 25 dining cars. The Great Northern has purchased 500 underframes and the Chicago & Northwestern and the Texas & Pacific will buy caboose car underframes.

With forward contracting well out of the way, Chicago producers are turning their attention to obtaining higher prices for plates, shapes and bars. One seller has named 2.10c. per lb. as the price on current business. Others are recognizing a spread of 2c. to 2.10c., depending on the size and character of orders.

Pig Iron.—Prices for Northern iron are firm at \$18.50 a ton. All furnaces in the immediate Chicago territory are lighted and shipments still overbalance output. Deliveries to foundries that cater to the automobile trade are lighter, but malleable producers appear to be little affected by the changed pace of motor car builders. A few large first quarter sales have been made. Sellers are showing more interest in soliciting 1929 business. Prices for silvery are stronger than in many months, and sales are being made subject to confirmation at the furnaces. The Southern iron market is quiet. Scattered lots of charcoal iron have been purchased at \$24 a ton, furnace.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	\$18.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	19.00
Malleable, not over 2.25 sil.	18.50
High phosphorus	18.50
Lake Super. charcoal, sil. 1.50	27.04
So'th'n No. 2 fdy. (all rail)	22.26
Low phos., sil. 1 to 2, copper free	\$28.50 to 29.00
Silvery, sil. 8 per cent	29.79
Bess. ferrosilicon, 14-15%	46.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Plates.—An inquiry for 7000 tons of plates for oil tank construction in the Southwest is before local mills. The railroad equipment market is quiet except for an order for 500 un-

derframes placed by the Great Northern. Current purchases of plates and releases against contracts are keeping local plate mills engaged at about 85 per cent of capacity. Prices, depending on tonnage, range from 2c. to 2.10c. Chicago.

Mill prices on plates, per lb.: 2c. to 2.10c. base Chicago.

Ferroalloys.—In specifications, this market remains active. Spiegeleisen in the 19 to 21 per cent grade has reached a firm basis at \$33 a ton, Hazard, Pa. Inquiry for ferromanganese is quiet, but quotations are steady at \$105, seaboard.

Prices delivered Chicago: 80 per cent ferromanganese, \$112.56; 50 per cent ferrosilicon, \$83.50 to \$87.50; spiegeleisen, 19 to 21 per cent, \$40.76.

Structural Material.—Structural projects are marking time and shop backlogs are growing lighter. Bids were submitted Oct. 15 on 1500 tons for the Rock Island, Ill., plant of the International Harvester Co. Several Western railroads have closed for their fourth quarter requirements of plates, shapes and bars. From all indications, most local fabricators will continue buying only for specific jobs, though several shops have closed small contracts for miscellaneous steel needed for orders expected in the coming months. Prevailing prices are 2c. to 2.10c., Chicago, depending on the tonnage.

Mill prices on plain material, per lb.: 2c. to 2.10c. base, Chicago.

Bars.—Current specifications for soft steel bars are lighter, but mill order books are well filled and mills continue at a high rate of output. Deliveries range from four to six weeks. Automobile parts plants are slowing down. Manufacturers of farm implements, especially tractors, are looking forward with a great deal of confidence and are taking steel at an unchanged rate. Shipments in 1928 from local steel mills to this class of users are the largest in history. It is again heard here that Ford will manufacture tractors. Prices for soft steel bars are steady at 2c. to 2.10c. per lb., Chicago. Mills are taking a firm stand for 2.10c. on all miscellaneous busi-

ness, while 2c. will rule on large tonnages. The iron bar market is without feature. Output of alloy steel bars has dropped to 80 per cent, following lighter releases by the automobile trade. Nail orders are characterized by diversity rather than by size. Prices are steady. Deliveries of rail steel bars are not better on the average than four weeks. Releases against contracts are heavy and spot purchases are in fair volume. Prices are firm at 1.95c. per lb., Chicago Heights. The fence post business is far below producers' expectations.

Mill prices per lb.: Soft steel bars, 2c. to 2.10c., base, Chicago; common bar iron, 2c. to 2.10c., base, Chicago; rail steel bars, 1.95c., base, Chicago Heights mill.

Rails and Track Supplies.—Of foremost interest are the purchase of 115,000 tons of standard-section rails by the Santa Fe and the inquiry of the New York Central for 190,000 tons. About 90,000 tons of the Santa Fe order went to the Colorado mill and 25,000 tons was divided between the Inland Steel Co. and the Illinois Steel Co. Nearly 30,000 tons of track accessories will be needed by the Santa Fe for laying these rails. The Erie purchase, mentioned a week ago, was distributed as follows: 24,471 tons to the Carnegie Steel Co., 11,151 tons to the Illinois Steel Co., 7500 to the Bethlehem Steel Co., and 3500 tons to the Inland Steel Co. Of 13,000 tons of track supplies ordered by the Chesapeake & Ohio, about 3000 tons will be made by Chicago mills. Miscellaneous orders of accessories in the week total 3000 tons. Several users have ordered small tonnages of light rails. Rail mill output remains steady on releases against 1927-28 contracts and small current purchases. The iron tie plate market is quiet, and prices are steady at \$43 a ton.

Prices f.o.b. mill, per gross ton: Standard-section open-hearth and Bess. rails, \$43; light rails, rolled from billets, \$36. Per lb.: Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.15c.; angle bars, 2.75c.

Cast Iron Pipe.—Interest is revived in this market by several sizable inquiries by local contractors for pipe that is to be laid before winter weather comes. James B. Clow & Sons are low bidders on 200 tons of 3-in. to 24-in. fittings for Chicago. Milwaukee closed bids Oct. 16 on 100 tons of 8-in. Class C pipe. Prices have been advanced to \$35 to \$37 a ton, Birmingham, for diameters 6 in. and larger.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, \$43.20 to \$45.20; 4-in., \$47.20 to \$49.20; Class A and gas pipe, \$4 extra.

Reinforcing Bars.—Activity in this market centers more around bidding and estimating fresh projects than in signing contracts. There is a noticeable pickup in construction of apartments of moderate size, also greater activity among promoters of apartment hotels. The Powhatan Hotel, requiring 500 tons, is up for figures. Among industrial projects of note is

1200 tons for a plant addition for the Western Electric Co. Incoming business is in smaller tonnage than shipments, with the result that shop backlogs are smaller and the current rate of output is assured for only three or four weeks. Competition is keen; prices, regardless of size or kind of bar used, are unsteady. Higher asking prices by mills have had no effect in strengthening reinforcing bar quotations. New contracts and fresh inquiry are given on page 994.

Bolts, Nuts and Rivets.—Lighter requirements by automobile manufacturers are being felt by producers of bolts, nuts and rivets. Output is in excess of shipments and the margin is being put in stock. Prices are firm on all products excepting large rivets.

Billets.—This market is quiet. Prices for rerolling billets, 4 in. and larger, are steady at \$33 a ton.

Wire Rods.—Shipments are in fair volume, and spot business at \$43 per ton is moderately active.

Cold-Rolled Strip.—Some producers of this commodity are considering an early advance of \$2 a ton. Order books are the largest in over three years, and shipments, with mills operating practically at capacity, are gradually becoming more deferred. Chicago delivered prices range from 3.05c. to 3.15c. per lb. The advance talked of would bring the upper limit of the range to 3.25c. The freight rate from Cleveland to Chicago is 30c. per 100 lb.

Sheets.—A realignment has taken place in sheet prices. Chicago delivered quotations on blue annealed have definitely settled to 2.15c. per lb. Black sheets are being sold at 2.90c., while galvanized sheets bring 3.65c. Contracting for fourth quarter is near an end. Following several weeks in which specifications were heavy, there is now less interest in releases, but deliveries have not improved beyond three to five weeks. Third quarter

Warehouse Prices, f.o.b. Chicago

Base per Lb.	
Plates and structural shapes.....	3.10c.
Soft steel bars.....	3.00c.
Reinforc'g bars, billet steel.....	2.15c. to 2.50c.
Reinforc'g bars, rail steel.....	2.00c. to 2.50c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons.....	3.60c.
Flats and squares.....	4.10c.
Bands.....	3.65c.
Hoops.....	4.15c.
Black sheets (No. 24).....	3.80c.
Galv. sheets (No. 24).....	4.65c.
Blue ann'd sheets (No. 10).....	3.35c.
Spikes, stand. railroad.....	3.55c.
Track bolts.....	4.55c.
Rivets, structural.....	3.60c.
Rivets, boiler.....	3.60c.
Per Cent Off List	
Machine bolts.....	60
Carriage bolts.....	60
Coach or lag screws.....	60
Hot-pressed nuts, sq., tap. or blank.....	60
Hot-pressed nuts, hex., tap. or blank.....	60
No. 8 black ann'd wire, per 100 lb.....	\$3.30
Com. wire nails, base per keg.....	3.10
Cement c't'd nails, base per keg.....	3.10

contracts have been specified in full, but hot mills have not yet completed these orders. Makers of light tanks are less busy, but sheet users in the stove and barrel industries are operating at a high rate. An improvement is noted in shipments to jobbers. Agricultural machinery manufacturers continue to take large quantities.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.90c.; No. 24 galv., 3.65c.; No. 10 blue ann'd, 2.15c. Deliv'd prices at other Western points are equal to the freight from Gary plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Wire Products.—Demand from practically all sources is lighter, but producers are holding to a 65 per cent rate of output, with the result that stocks are slowly accumulating at mills. Specifications from the automobile trade are fewer, but still average fully 40 per cent heavier than at this time a year ago. Many consumers are buying at close range and pressing for deliveries. Buyers who are obligated for the final quarter have well-arranged shipping schedules, so that with lighter specifications there is not a great change in the rate of deliveries. The jobbing trade continues to lag; most sellers, taking into account the lateness of the season, have little hope that conditions in this trade will be bettered this fall. Orders from the South are consistent but not large, but heavier shipments are being made to the Northwest. Demand for nails is running behind that of the early fall months of 1927.

Old Material.—Prices for most grades of scrap are strong and consumers' interest remains high. Consumption is heavy and pressure for delivery is severe. In specialties, spot cars are eagerly sought and car tracing is giving considerable trouble to dealers. For the most part, consumers still resist prices by making purchases in small lots for immediate use. Producers of scrap are being pressed to make shipments, with the result that the average carload is lighter than at the turn of the month. Supplies available at car shops are small and sales by automobile car manufacturers are measurably lighter. Cars coming on track from railroads are fewer in number. These factors are believed by some to be indicators of a sustained market over the next four to six weeks. However, higher prices at points of consumption are inducing country dealers to release stocks. Several weeks ago this market was tight on short rails, but shipments from as far as St. Paul have relieved the situation. It is evident, too, that local yard dealers are willing at present price levels to liquidate holdings gathered when prices were low. There is little reason to doubt that the supply is still in excess of demand, but the margin is close and the variation from week to week makes the market difficult to gage. In many instances dealers are being forced to pay prices equal to the figures written in contracts. The Santa Fe has obtained

\$14.90 a gross ton, delivered, on 1000 tons of heavy melting steel. Direct bidding on railroad lists by consumers is more common.

Prices deliv'd Chicago district consumers: Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel.....	\$14.00 to \$14.50
Shoveling steel.....	14.00 to 14.50
Frogs, switches and guards, cut apart, and misc. rails	15.50 to 16.00
Hydraul. compressed sheets	12.25 to 12.75
Drop forge flashings.....	9.50 to 10.00
Forg'd, cast and r'd steel carwheels.....	17.25 to 17.75
Rail'd tires, charg. box size.....	17.25 to 17.75
Rail'd leaf spring cut apart.....	17.25 to 17.75

Acid Open-Hearth Grades:	
Steel couplers and knuckles	15.75 to 16.25
Coil springs.....	18.25 to 18.75

Electric Furnace Grades:	
Axle turnings.....	13.50 to 14.00
Low phos. punchings.....	15.50 to 16.00
Low phos. plate, 12 in. and under.....	15.50 to 16.00

Blast Furnace Grades:	
Axle turnings.....	11.00 to 11.50
Cast iron borings.....	10.50 to 11.00
Short shoveling turnings.....	10.50 to 11.00
Machine shop turnings.....	6.75 to 7.25

Rolling Mill Grades:	
Iron rails.....	14.75 to 15.25
Rerolling rails.....	16.50 to 17.00

Cupola Grades:	
Steel rails less than 3 ft.....	17.25 to 17.75
Angle bars, steel.....	16.50 to 17.00
Cast iron carwheels.....	13.75 to 14.00

Malleable Grades:	
Railroad.....	15.25 to 15.75
Agricultural.....	12.50 to 13.00

Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.....	26.00 to 31.00

Per Net Ton	
Rolling Mill Grades:	
Iron angles and splice bars	14.50 to 15.00
Iron arch bars and transoms.....	20.50 to 21.00
Iron car axles.....	25.50 to 26.00
Steel car axles.....	16.25 to 16.75
No. 1 railroad wrought.....	12.75 to 13.25
No. 2 railroad wrought.....	12.50 to 13.00
No. 1 busheling.....	11.00 to 11.50
No. 2 busheling.....	6.00 to 6.50
Locomotive tires, smooth.....	13.00 to 13.50
Pipes and flues.....	9.00 to 9.50
Cupola Grades:	
No. 1 machinery cast.....	15.50 to 16.00
No. 1 railroad cast.....	14.50 to 15.00
No. 1 agricultural cast.....	13.75 to 14.25
Stove plate.....	11.50 to 12.00
Grate bars.....	12.25 to 12.75
Brake shoes.....	11.50 to 12.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Windows built of inflammable material are never a protection against fire is a conclusion reached by the National Fire Protection Association, which recently issued a survey of the Fall River conflagration of Feb. 2. "The failure of wired glass windows because of the use of ordinary frames presents an interesting lesson as to the importance of metal frames for wired glass windows," states the association. The frames must be so designed that the glass will positively remain in place even when the expansion caused by the heat of the fire may have bowed out the glass and seriously distorted the frame."

Philadelphia

Eastern Pennsylvania Mills Operating at High Rate—Basic Pig Iron Sold at an Advance

PHILADELPHIA, Oct. 16.—Operating rates of eastern Pennsylvania mills range from about 85 per cent to 93 per cent. Most steel consumers are covered by contracts for the fourth quarter, so that new buying is limited to small orders. Specifications against contracts, however, are heavy, and plate and sheet mills have four to five weeks' work ahead. Producers of shapes are not in so satisfactory a position as other mills, but have a fair volume of business on their books. A steel company has announced an advance on foundry pig iron to \$20.50 per ton, furnace, and other producers are asking \$20.50 on carload lots. Two small tonnages of basic have been closed at an advance in price from the previous basic sale, and a sizable order is still pending from an eastern Pennsylvania plate mill. Prices of iron and steel scrap are strong, with a slight upward tendency, but new contracts on scrap are in most cases for small tonnages.

Pig Iron.—An eastern Pennsylvania plate producer, which bought 25,000 tons of basic pig iron about 30 days ago, has come into the market again for 20,000 tons. Two smaller users of basic in this district have closed on 2500 to 5000 tons at \$19.75 per ton, delivered, an advance from the previous purchase price. A steel company producer has advanced its quotation to \$20.50 per ton for foundry iron, and this is the usual asking price of other furnaces on the smaller lots. Although sellers are apparently willing to make contracts for first quarter at \$20.50, base, none of the eastern Pennsylvania furnaces is seeking business at this price, and consumers have shown only moderate interest in deliveries beyond the first of the year. Low phosphorus iron is quiet, but prices are firm on both the copper bearing and copper free grades. The Virginia producer of iron has booked an order for 10,000 tons from a Virginia pipe foundry. The Virginia market is firm at \$20, base furnace.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	\$20.76 to \$21.26
East. Pa. No. 2X, 2.25 to 2.75 sil.	21.26 to 21.76
East. Pa. No. 1X, 2.176 to 2.226	21.76 to 22.26
Basic (del'd east. Pa.)	19.75
Gray forge	19.75 to 20.25
Malleable	21.00 to 21.50
Stand. low phos. (f.o.b. N. Y. State furnace)	22.00 to 23.00
Cop. b'g low phos. (f.o.b. furnace)	23.00 to 23.50
Va. No. 2 plain, 1.75 to 2.25 sil.	24.54
Va. No. 2X, 2.25 to 2.75 sil.	25.04

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

Ferromanganese.—Domestic producers report a continuance of heavy requisitions for ferromanganese. The price is firm and unchanged at \$105 per ton, seaboard, for both the domestic and foreign product.

Bars.—Mills are booked with business for several weeks, many of the contracts for this quarter being at 1.95c. per lb., Pittsburgh, or 2.27c., Philadelphia. Some large buyers, who have been receiving third quarter deliveries on low-priced contracts, are now under contract at 1.90c., Pittsburgh, or 2.22c., Philadelphia. On miscellaneous new business mills re-

port 2c., Pittsburgh, or 2.32c., Philadelphia, as firm.

Shapes.—Quotations f.o.b. nearest mill to the consumer are becoming quite common with mills in this district, so that, while the market continues firm at 2.05c. per lb., base, quotations are made f.o.b. Pencoyd, Pottsville, Bethlehem and occasionally Phoenixville. Structural mills are not so well off as to tonnage as other steel producers, but report a fair amount of business on their books and a steady flow of specifications against contracts.

Plates.—Operations in this district are at about 90 per cent of capacity. Deliveries are becoming more extended. Shipments are going forward on contracts at 2.05c., Coatesville, or 2.15c., Philadelphia. On new business, 2.10c., Coatesville, or 2.20c., Philadelphia, is reported still quoted on desirable orders, but on small lots the quotation is 2.15c., Coatesville, or 2.25c., Philadelphia.

Sheets.—Black and galvanized sheets continue firm at 2.75c., Pittsburgh, or 3.07c., Philadelphia, on black and 3.50c., Pittsburgh, or 3.82c., Philadelphia, on galvanized. Blue annealed sheets are firm at 2.10c., base Pittsburgh, on widths greater than 45

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅝-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.70c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel, planished	4.30c.
Reinforc. steel bars, sq. twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.45c.
Cold-fin. steel, sq. and flats	3.95c.
Steel hoops	3.60c.
Steel bands, No. 12 to ⅝-in., inclus.	3.35c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.85c.
†Galvanized sheets (No. 24)	4.60c.
Blue ann'd sheets (No. 10)	3.00c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅝-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

in., but on the narrower sheets, continuous mills are still willing to quote 1.90c. to 1.95c., Pittsburgh, so that 2c., base, for blue annealed in these competitive widths is not so firm as the base price on wide sheets. Mills are fully engaged for the next four to six weeks.

Warehouse Business.—Jobbers report a steady flow of orders, particularly in galvanized sheets. Prices and quantity differentials are firmly maintained.

Imports.—In the week ended Oct. 13, iron ore arrivals at this port consisted of 5802 tons from Algeria. Of 1282 tons of manganese ore received, 1250 tons was from British India and 32 tons from Germany. Pig iron receipts were 500 tons from British India. Steel imports consisted of 402 tons of structural shapes and 6 tons of steel bars from Belgium, 506 tons of steel skelp from France and 23 tons of steel scrap from the United Kingdom.

Old Material.—All grades of iron and steel scrap are firm, partly a reflection of the strong market in western Pennsylvania. Recent contracts made by consumers in this district have been small, but at the present level of prices. Machine shop turnings are being bought by a broker-buying agent for a Phoenixville consumer at \$11.50 per ton, and another broker is paying \$12 per ton, delivered in eastern Pennsylvania. Stove plate is firm at \$13 per ton, delivered. Forge fire, bought at \$13 per ton by a consumer at Reading, Pa., is understood to have been of a high quality, for which the buyer was willing to pay a slight premium.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	\$16.00
Scrap T rails	\$15.50 to 16.00
No. 2 heavy melting steel	13.00 to 13.50
No. 1 railroad wrought	15.50 to 16.00
Bundled sheets (for steel works)	11.50 to 12.00
Machine shop turnings (for steel works)	11.50 to 12.00
Heavy axle turnings (or equiv.)	12.50 to 13.50
Cast borings (for steel works and roll. mill)	11.00 to 11.50
Heavy breakable cast (for steel works)	16.50 to 17.00
Railroad grate bars	13.00 to 13.50
Stove plate (for steel works)	13.00
No. 1 low phos., hvy., 0.04% and under	19.00 to 20.00
Couplers and knuckles	17.00 to 17.50
Roller steel wheels	17.00 to 17.50
No. 1 blast fnace scrap	10.00 to 10.50
Wrot. iron and soft steel pipes and tubes (new specific.)	14.50 to 15.00
Shafting	19.00 to 20.00
Steel axles	22.00 to 23.00
No. 1 forge fire	12.00 to 13.00
Cast iron carwheels	16.50 to 17.00
No. 1 cast	17.00 to 17.50
Cast borings (for chem. plant)	14.50 to 15.00
Steel rails for rolling	15.50 to 16.00

September shipments of electric industrial trucks and tractors are reported by the Department of Commerce at 118 units, of which five were for export. This is the highest total since April, when 136 units were shipped. It compares with 96 in August. A year ago there were only 79.

New York

Steel Prices Stiffen on Current Small Orders—New York Central to Buy 190,000 Tons of Rails

NEW YORK, Oct. 16.—The pig iron market is passing through a lull such as frequently follows a period of active contracting. Sales for the week were made up of relatively small lots and totaled only about 7000 tons. New inquiries are mainly for fill-in tonnages for early delivery, and it is unlikely that demand will again be active until consumers are ready to cover their first quarter requirements. Among current inquiries is one from the General Electric Co. for 1200 tons for its Elmira, N. Y., plant and 500 tons each for its Pittsfield and Lynn, Mass., works. Except for this inquiry and one for 1200 tons for delivery in this district, pending business includes no outstanding tonnages. Sales of foundry iron by New York State and New England furnaces continue at \$17, base Buffalo, or the equivalent. Pressure for shipments is unabated, and there is every indication that foundry melt is holding its own, if not gaining.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil.	1.75	
to 2.25		\$21.91
*Buf. No. 2, del'd east.		
N. J.		20.28
No. 2, del'd east. N. J.		
tidewater	\$20.01 to 21.25	
East. Pa. No. 2 fdy., sil.		
1.75 to 2.25		20.89 to 22.02
East. Pa. No. 2X fdy., sil.		
2.25 to 2.75		21.39 to 22.52
East. Pa. No. 1X fdy., sil.		
2.75 to 3.25		21.89 to 23.02

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.
*Price delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

Plates, Shapes and Bars.—Following the large orders and specifications for the heavy tonnage products in the latter part of September and the first week of October, there has been a decided letdown in the past week. This is not a surprising development, as consumers are covered for a month or longer, and it is not to be expected that orders in volume will be forthcoming until present commitments are nearing exhaustion. Mill representatives are in a happy frame of mind, not only because of the relatively full engagement of the mills, but because of the minimum of opposition among buyers to the higher prices now being asked. Some consumers, whose buying habits have tended toward last-minute ordering with requests for prompt shipment, now find that they must await mill convenience. Small orders for urgent needs are in most cases taking the top prices. Large buyers have been covered at 2.22½c., New York for plate; 2.19½c., New York, for shapes, and 1.90c., Pittsburgh, for bars, but these prices are now being rarely quoted, and current sales are more frequently at \$1 or \$2 a ton higher. A promise of quick delivery is more potent in getting some orders than price. Mill operations in the East are at a high rate. The

Bethlehem Steel Co. is running its plants at about 90 per cent, and Eastern plate mills have the best operation in many months. In addition to 3000 tons of reinforcing bars, a warehouse to be built in New Jersey for the Delaware, Lackawanna & Western

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.50c.
Flats and squares	4.00c.
Cold-roll. strip, soft and quarter hard	6.15c. to 5.40c.
Hoops	4.50c.
Bands	4.00c.
Blue ann'd sheets (No. 10)	3.85c. to 3.90c.
Long term sheets (No. 24)	5.60c. to 5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, 1½ x ½ in. and larger	3.30c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.65c.
Open-hearth spring steel, bases	4.50c. to 7.00c.
Machine bolts, cut thread:	Per Cent Off List
¾ x 6 in. and smaller	.60
1 x 30 in. and smaller	.50 to 50 and 10
Carriage bolts, cut thread:	
¾ x 6 in. and smaller	.60
¾ x 20 in. and smaller	.50 to 50 and 10
Coach screws:	
¾ x 6 in. and smaller	.60
1 x 16 in. and smaller	.50 to 50 and 10
Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	\$17.33
Seamless steel, 2-in.	20.24
Charcoal iron, 2-in.	25.00
Charcoal iron, 4-in.	67.00

Discount on Welded Pipe		
Standard Steel—	Black	Galv.
¾-in. butt.	46	29
¾-in. butt.	51	37
1-3-in. butt.	53	39
2½-6-in. lap.	48	35
7 and 8-in. lap.	44	17
11 and 12-in. lap.	37	12
Wrought Iron—		
¾-in. butt.	5	+19
¾-in. butt.	11	+9
1-1½-in. butt.	14	+6
2-in. lap.	5	+14
3-6-in. lap.	11	+6
7-12-in. lap.	3	+16

Tin Plate (14 x 20 in.)		
	Prime	Seconds
Coke, 100 lb. base box	\$6.45	\$6.20
Charcoal, per Box—	A	AAA
IC	\$9.70	\$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)		
IC—20-lb. coating	\$10.00 to \$11.00	
IC—30-lb. coating	12.00 to 13.00	
IC—40-lb. coating	13.75 to 14.25	

Sheets, Box Annealed—Black, C. R.

One Pass		
	Per Lb.	
Nos. 18 to 20	3.60c. to 3.80c.	
No. 22	3.75c. to 3.95c.	
No. 24	3.80c. to 4.00c.	
No. 26	3.90c. to 4.10c.	
No. 28*	4.05c. to 4.25c.	
No. 30	4.30c. to 4.50c.	

Sheets, Galvanized		
	Per Lb.	
No. 14	4.15c. to 4.35c.	
No. 16	4.00c. to 4.20c.	
No. 18	4.15c. to 4.35c.	
No. 20	4.30c. to 4.50c.	
No. 22	4.35c. to 4.55c.	
No. 24	4.50c. to 4.70c.	
No. 26	4.75c. to 4.95c.	
No. 28*	5.00c. to 5.20c.	
No. 30	5.40c. to 5.60c.	

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

Railroad will take 1000 to 3000 tons of sheet steel piling. The New York Central Railroad has issued its annual inquiry for rails, calling for 190,000 tons.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.24c. to 2.34c.; plates, 2.22½c. to 2.32½c.; struc. shapes, 2.19½c. to 2.22½c.; bar iron, 2.14c.

Warehouse Business.—October has been a better month for business than September, and some jobbers expect it will be the best month of the year. Demand for structural material continues good. Individual orders are increasing in tonnage. Black and galvanized sheet prices are firmer than for some time. Galvanized sheet orders are numerous.

Coke.—More ovens are being lighted in the Connellsville district, but prices of the standard furnace grade are stronger, ranging from \$2.95 to \$3.05 per ton, Connellsville. Some of this firmness is reflected in the market on foundry coke, which ranges from \$3.50 to \$3.75 per net ton, Connellsville. Standard brands are unchanged at \$4.85 per net ton, ovens, or \$8.56 per net ton delivered to northern New Jersey, Jersey City and Newark and \$9.44 per ton to New York and Brooklyn. By-product foundry coke prices are \$9 to \$9.40, Newark or Jersey City, and \$10.06, New York or Brooklyn.

Cast Iron Pipe.—Southern makers are quoting prices considerably higher than the bids of Northern foundries. On a recent opening in the New York territory, tenders are reported to have been on a basis of \$32.50 per net ton, f.o.b. Florence, N. J., and \$33 per ton, f.o.b. Burlington, N. J. Among current inquiries is one for 14,000 tons of 6 to 30-in. water pipe for Warwick, R. I. Herkimer, N. Y., is taking bids on 1300 tons of water pipe.

Prices per net ton, deliv'd New York: Water pipe, 6-in. and larger, \$35.60 to \$36.60; 4-in. and 5-in., \$40.60 to \$41.60; 3-in., \$50.60 to \$51.60; Class A and gas pipe, \$4 to \$5 extra.

Sheets.—Many sheet buyers who did not cover their fourth quarter requirements in full, now confronted with a mill situation which makes early deliveries almost impossible, are placing orders for shipment at mill convenience, which generally means four to six weeks. Prices are firm on all grades. The week's purchases have disclosed little or no objection to 2.75c., Pittsburgh, on black, 3.50c. on galvanized and 2c. on blue annealed narrower than 45 in.

Reinforcing Bars.—Several fair-sized jobs have been placed in the last week at the new scale of prices, and the market seems to be quite firm. Interest is centered in the terminal warehouse for the Delaware, Lackawanna & Western Railroad at Jersey City, which will require about 3000 tons of bars, and in the water tunnel for the New York Board of Water Supply, calling for 2850 tons. Both of these jobs will likely be placed soon. The Pittsburgh mill price for 40, 50 and 60-ft. lengths is 2c. per lb., and out of Pittsburgh mill warehouse

distributors are quoting 2.25c., or 2.59c., on cars at New York. New York warehouse prices are unchanged, ranging from 2.80c. to 3.24c. per lb., all delivered at job.

Old Material.—Although no further purchases of No. 1 heavy melting steel are reported by eastern Pennsylvania mills, brokers are paying as much as \$15.75 per ton, delivered to Claymont, Del., and Coatesville, Pa., and \$15 per ton is quoted for delivery to Bethlehem, Pa. Some brokers are offering \$12.50 per ton, New York, for No. 1 heavy melting steel for shipment to western Pennsylvania. Machine shop turnings are being purchased at \$11.50 and \$11.75 per ton, delivered Phoenixville, Pa., and at \$12 per ton, delivered Conshohocken, Pa. Other grades of scrap are substantially unchanged, but the undertone of strength continues.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	\$12.00 to \$12.50
Heavy melting steel (yard)	8.75 to 9.50
No. 1 hvy. breakable cast.	12.75 to 13.50
Stove plate (steel works)	8.75 to 9.00
Locomotive grate bars	9.25 to 10.25
Machine shop turnings	8.00 to 8.50
Short shoveling turnings	8.00 to 8.50
Cast borings (blast furn. or steel works)	6.50 to 7.50
Mixed borings and turnings	6.75 to 7.25
Steel car axles	18.00 to 18.50
Iron car axles	25.25 to 26.25
Iron and steel pipe (1 in. dia., not under 2 ft. long)	10.75
Forge fire	8.50 to 9.00
No. 1 railroad wrought	11.75 to 12.25
No. 1 yard wrot., long	10.75 to 11.25
Rails for rolling	11.50 to 12.00
Cast iron carwheels	13.00 to 13.50
Stove plate (foundry)	9.50 to 10.00
Malleable cast (railroad)	10.00 to 10.50
Cast borings (chemical)	11.25

Prices per gross ton, deliv'd local foundries:

No. 1 machy. cast	\$17.00 to \$18.00
No. 1 hvy. cast (columns, bldg. materials, etc.)	
cupola size	15.00 to 16.00
No. 2 cast (radiators, cast boilers, etc.)	14.50 to 15.50

British Steel Output Gains in September

LONDON, ENGLAND, Oct. 15 (*By Cable*).—Pig iron output in September was 503,900 gross tons, and production of steel ingots and castings was 718,600 tons.

A comparison of the September output with that of the eight preceding months of the year, and with the monthly rate for previous years is as follows, in gross tons:

	Pig Iron, Tons	Steel Ingots and Castings, Tons
1913—Av. monthly	855,000	638,600
1920—Av. monthly	669,500	755,600
1922—Av. monthly	408,500	490,100
1923—Av. monthly	620,000	706,800
1924—Av. monthly	609,900	685,100
1925—Av. monthly	519,700	616,400
1926—Av. monthly	203,500	296,700
1927—Av. monthly	607,800	758,200
1928—January	560,600	626,200
1928—February	550,800	764,400
1928—March	592,600	793,300
1928—April	555,000	644,100
1928—May	591,500	752,700
1928—June	563,700	709,500
1928—July	537,800	666,900
1928—August	519,000	648,300
1928—September	503,900	718,600

The September pig iron output was the smallest thus far this year, while steel production was the fourth largest.

Cleveland

Bookings of Finished Steel Fall Off But Volume is Still Good, Particularly From Automotive Industry

CLEVELAND, Oct. 16.—While bookings of finished steel continued good the past week, the volume with some mills was not as heavy as during the first week of the month. Steel bars are in very good demand, particularly from the automotive industry, and structural shapes are moving well. Plates are lagging somewhat, not being as active as a few weeks ago. Most orders are small and consumers want quick delivery. Many consumers of the heavy rolled products have made fourth quarter contracts.

No marked decrease in the demand for steel from the automotive industry is noticeable, but a falling off in orders is expected during the remainder of the month, as some of the automobile manufacturers will shut down for inventories for two or three weeks about Nov. 1. Their output, on resuming operations, doubtless will depend on the demand for motor cars at that time. The Chevrolet Motor Car Co., which is completing work on its old models, will start production on its new models next month, and its new demands for steel will at least partly offset a slowing down in orders from other automobile plants.

The automotive industry is looking ahead to 1929 and predicting that this year's record in output of cars will be broken next year.

Structural inquiry is fairly plentiful, particularly for small lots, and the smaller fabricators are said to be busier than they have been for some time. A dam over the Mississippi River at Hastings, Neb., will require 3000 tons of steel, mostly in reinforcing bars and piling.

Prices are well maintained at 1.95c., Pittsburgh, for steel bars, plates and structural material on the bulk of current business. Outside bar mills, using a Cleveland base, quote steel bars at 1.95c. to 2.05c., Cleveland, while Cleveland mills generally quote 1.90c., Cleveland.

Pig Iron.—The demand for iron in shipments on contracts continues heavy. Stock piles of some furnaces have been almost wiped out and producers are not as prompt as they were in making deliveries. Shipments by some furnaces so far this month have exceeded those during the same period in September. The automotive industry is taking iron at the recent volume, and there has been an increase in shipping orders from other consumers. The market is still fairly active. First quarter inquiry so far has been rather moderate, and, while some of the Lake furnaces have made sales of foundry and malleable iron for that delivery, furnaces located in Cleveland have not yet opened their books. One Lake furnace interest, which took some first quarter business in western

Ohio at \$18, has advanced its price 50c. a ton to \$18.50 for that territory and for Indiana shipment. For delivery in central Ohio, where there is more competition, \$18 is being quoted for the first quarter. However, the first quarter price situation will not be definitely cleared up in some sections until Cleveland and Valley furnaces open their books for that delivery. For Michigan delivery, the first quarter price is well established on several sales at \$18.50, which has been the ruling quotation for a few weeks. A Muncie, Ind., consumer which inquired for 6000 tons of malleable iron for the first quarter, has postponed buying. The Valley foundry iron market shows a firmer tone, with sizable sales at \$17.50. Cleveland interests sold 26,000 tons during the week, about one-third of which was for the first quarter. Inquiry for low phosphorus iron has become more active. While one 200-ton lot brought \$27, a 50c. a ton lower price has not disappeared.

Prices per gross ton at Cleveland:

N'th'n fdy., sil.	1.75 to 2.25	\$18.50
S'th'n fdy., sil.	1.75 to 2.25	22.25
Malleable		18.50
Ohio silvery, 8 per cent.		28.00
Basic Valley furnace		17.00
Stand. low phos., V'ley fur.	\$26.50 to	27.00

Prices, except on basic and low phosphorus, are delivered Cleveland. Freight rates: 50c. from local furnaces; \$3 from Jackson, Ohio; \$6 from Birmingham.

Iron Ore.—A few small-lot sales are still being made for fill-in purposes. The dock balance at Lake Erie ports Oct. 1 was 6,100,456 tons, compared with 6,768,735 tons on the same date a year ago. Receipts at Lake Erie ports during September were 5,826,530 tons and for the season 27,341,510 tons, compared with 29,792,366 tons during the same period last year. Shipments from Lake Erie ports during September were 3,884,346 tons and for the season 19,480,038 tons, compared with 21,556,077 tons during the same period last year. Shipments to other than Lake Erie ports show a gain compared with last year. These, including shipments to interior furnaces from South Chicago, were 12,320,763 tons, against 11,304,643 tons during the same period last year.

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struct. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex.	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands	3.65c.
Cold-finished strip	5.95c.
Black sheets (No. 24)	3.50c.
Galvanized sheets (No. 24)	4.25c.
Blue ann'l'd sheets (No. 10)	3.35c.
No. 9 ann'l'd wire, per 100 lb.	\$2.85
No. 9 gal. wire, per 100 lb.	3.30
Com. wire nails, base per keg	2.85

*Net base, including boxing and cutting to length.

Strip Steel.—Mills are still getting a good volume of orders against contracts for hot-rolled strip, but there is very little new business. While several producers have announced that they will adopt the new card of extras, some have not yet got out their printed cards and it will take some time for consumers to familiarize themselves with the price changes. These will not become generally effective until the first quarter, as larger consumers are covered for the remainder of the year. Cold-rolled strip is fairly active. The market is firm at 2.75c., Cleveland, for good lots, some small-lot business being taken at 2.85c.

Semi-Finished Steel.—A Cleveland mill has taken a large volume of business for the fourth quarter at \$33, Cleveland, Youngstown and Pittsburgh, for sheet bars, large billets and slabs, with a \$1 a ton higher price for under 4-in. billets. There is already talk of higher prices for the first quarter. Forging billets range from \$38 to \$39, Ohio mill. Specifications for sheet bars, billets and slabs are heavy.

Sheets.—Orders are still plentiful, apparently equal to production, so that there is no change in the delivery situation. Few mills can make shipments within four weeks, and deliveries are further extended on automobile body sheets. These and black sheets in the common finishes are in better demand than other grades. Most of the mills are holding firmly to regular prices and are meeting little price resistance. However, on attractive business a few cases of price shading of from \$1 to \$2 a ton are reported on black sheets, and a buyer of 1300 tons of blue annealed sheets was able to obtain a concession. An inquiry for 400 tons of galvanized sheets failed to reveal weakness on that grade. Cleveland stamping plants have taken orders for running boards for the new models of Chevrolet cars, which it is estimated will require 5000 tons of sheets for a three months' production. These sheets have not yet been purchased.

Reinforcing Bars.—While several fair-sized jobs are still pending, inquiry for steel for building work has fallen off. However, the demand for steel for road work is very active. Warehouse prices are better maintained than recently, holding rather closely to 2.25c., Pittsburgh.

Warehouse Business.—Sales show a gain over last month's, doubtless due partly to some slowing down in mill deliveries. Galvanized sheets are quite active. Prices are well maintained.

Coke.—By-product coke for domestic use is fairly active. This is quoted at \$4.50, Valley, for egg size, and \$5, Cleveland, for egg and \$4.85 for nut for outside shipment. The price differential between Valley and Cleveland producers equalizes the freight rate to some important consuming points. For Cleveland delivery, egg

coke is quoted at \$6, delivered. Foundry coke is quiet and unchanged at \$4, Connellsville, for good brands and \$7.75, Painesville, for Ohio by-product coke.

Old Material.—The market continues very firm and prices have advanced further on several grades. Dealers are paying \$14.25 for No. 1 heavy melting steel for delivery to one Cleveland mill and \$15 to \$15.25 for shipment to another, which requires higher grade material. For Youngstown shipment, the price dealers are paying has advanced to \$16.50 for No. 1 heavy melting steel. For compressed sheet steel, they are paying \$16 to \$16.50 for the same delivery. Machine shop turnings and blast furnace scrap have advanced 25c. a ton. On the latter, \$10.50 has become the ruling price, although sales are reported at \$10.75. Mills still appear to be well supplied with scrap, as they are getting shipments at a fair rate and they are showing no interest in new orders.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades	
No. 1 heavy melting steel.....	\$14.00 to \$14.50
No. 2 heavy melting steel.....	13.25 to 13.50
Compressed sheet steel.....	13.50 to 14.00
Light bundled sheet stamp'gs.....	11.50 to 11.75
Drop forge flashings.....	12.25 to 12.75
Machine shop turnings.....	9.25 to 9.75
No. 1 railroad wrought.....	12.75 to 13.00
No. 2 railroad wrought.....	14.50 to 15.00
No. 1 busheling.....	13.00 to 13.25
Pipes and flues.....	9.00 to 9.50
Steel axle turnings.....	12.50 to 13.00
Acid Open-Hearth Grades	
Low phos. forging crops.....	16.00 to 16.50
Low phos., billet, bloom and slab crops.....	17.00 to 17.50
Low phos. sheet bar crops.....	16.50 to 17.00
Low phos. plate scrap.....	15.50 to 16.00
Blast Furnace Grades	
Cast iron borings.....	10.50 to 10.75
Mixed bor'gs and short turn'gs.....	10.50 to 10.75
No. 2 busheling.....	10.50 to 10.75
Cupola Grades	
No. 1 cast.....	16.50 to 17.00
Railroad grate bars.....	11.00 to 12.00
Stove plate.....	12.00 to 12.50
Rails under 3 ft.....	16.75 to 17.25
Miscellaneous	
Railroad malleable.....	16.00 to 16.50
Rails for rolling.....	16.25 to 16.50

Lower Production of Track Work

Shipments of track work for T-rail track of 60 lb. and heavier are reported for September by the American Iron and Steel Institute at 10,767 net tons. This is the lowest figure since last January. It compares with 11,040 tons in August and with 10,999 tons a year ago. For the third quarter, shipments aggregated 33,583 tons. This is, with one exception, the lowest quarter's shipments in several years. It compares with 41,368 tons in the second quarter of this year, with 37,603 tons in the third quarter of last year, and with 45,997 tons in the third quarter of 1926. Shipments in the first nine months were 110,712 tons, compared with 131,872 tons in the same period last year and 154,663 tons in 1926.

Steel Corporation's Orders Increase in September

Another increase in the unfilled orders of the United States Steel Corporation was recorded in September. The total on Sept. 30 was 3,698,368 tons, compared with 3,624,043 tons on Aug. 31—an increase of 74,325 tons. In August the increase was 53,116 tons, while in July there was a decrease of 66,082 tons. A year ago, on Sept. 30, the unfilled orders were 3,148,113 tons, or 550,255 tons less than this year. The table gives the reported figures for the last 12 months.

	1928	1927
Jan. 31.....	4,275,947	3,800,177
Feb. 28.....	4,398,189	3,597,119
Mar. 31.....	4,335,206	3,553,140
April 30.....	3,872,133	3,456,132
May 31.....	3,416,822	3,050,941
June 30.....	3,637,009	3,053,246
July 31.....	3,570,927	3,142,014
Aug. 31.....	3,624,043	3,196,037
Sept. 30.....	3,698,368	3,148,113
Oct. 31.....	.....	3,341,040
Nov. 30.....	.....	3,454,444
Dec. 31.....	.....	3,972,874

At the end of April, 1917, the highest total in unfilled orders of the Steel Corporation ever attained was reported at 12,183,193 tons. The lowest figure ever reported was 2,754,757 tons, Dec. 31, 1910.

Reduction in Output of Foundry Supplies

Establishments engaged primarily in the manufacture of foundry supplies reported products valued at \$11,635,060 in 1927, a decrease of 8.6 per cent as compared with \$12,723,120 for 1925, the preceding census year, according to the Bureau of the Census, Washington. In addition, foundry supplies are made to some extent by establishments classified in other industries. The value of such products made outside of the industry proper in 1925 was \$1,080,801. The corresponding value for 1927 has not yet been ascertained.

Establishments classified in this industry are those engaged in the manufacture of foundry facings, molding sand, cement for castings, core oils and compounds, chaplets, wax, flux, "parting" composition, flasks, riddles or sieves, pipe blacking and plumbago. Facings and supplies made by foundries for their own use are not, as a rule, reported separately.

Sustained demand for cars and trucks, according to *Automotive Industries*, is continuing factory operations at a rate far in excess of the usual fourth-quarter level and only slightly lower than in the record breaking third-quarter just closed. There are as yet no signs of any extensive stocking of new cars by dealers and several factories are weeks behind in meeting dealer demand. Two important manufacturers' plans for European sales in 1929 indicate greatly increased demand for American cars.

Pacific Coast

Gas Line to Take 50,000 Tons of Pipe—Oil Tanks Call for 2000 Tons of Plates

SAN FRANCISCO, Oct. 13 (*By Air Mail*).—Developments in the Pacific Coast iron and steel markets this week include the award of five additional 134,000 bbl. tanks requiring 2000 tons of plates, by the General Petroleum Corporation, Los Angeles, to McClintic-Marshall Co., and the announcement that a new company has been organized to construct a natural gas pipe line from Ventura to San Francisco. For this project, about 50,000 tons of line pipe will be used.

Building operations on the Pacific Coast are steady. September permits for the five principal cities were as follows: Los Angeles, \$8,505,327; San Francisco, \$2,422,080; Oakland, \$1,777,005; Seattle, \$1,474,210; Portland, \$1,281,216. Permits issued in Los Angeles in September of this year were less than the total for the same month last year.

Pig Iron.—Demand for foundry pig iron has not increased appreciably during the past month. During the past 10 days about 1400 tons of Indian iron arrived on the Coast. The next large shipment is due Nov. 28. Prices are unchanged.

Prices per gross ton at San Francisco:

*Utah basic.....	\$25.00 to \$26.00
*Utah fdy., sil. 2.75 to 3.25.....	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25.....	24.00 to 25.00

*Delivered San Francisco.

**Duty paid, f.o.b. cars San Francisco.

Bars.—The only large award of reinforcing steel bars this week went to the Pacific Coast Steel Co.—575 tons for three buildings at Fort Lewis, Wash., for the United States Army. The largest pending project calls for 1800 tons for the Life Science Building at the University of California at Berkeley. New business includes 675 tons for a warehouse for Sears, Roebuck & Co. in San Francisco, 164 tons for a drainage project at Los Angeles and 129 tons for a highway extension in Orange County, Cal. Out-of-stock prices in Los Angeles and San Francisco continue weak, and 1.80c., base, is general.

Plates.—The General Petroleum Corporation, Los Angeles, has placed five additional 134,000 bbl. storage tanks with the Riter-Conley Co., through the McClintic-Marshall Co. About 2000 tons of plates will be re-

Warehouse Prices, f.o.b. San Francisco

Base per Lb.	
Plates and struc. shapes.....	3.15c.
Soft steel bars.....	3.15c.
Small angles, $\frac{3}{8}$ -in. and over.....	3.15c.
Small angles, under $\frac{3}{8}$ -in.....	3.55c.
Small channels and tees, $\frac{3}{8}$ -in. to 2 $\frac{1}{2}$ -in.....	3.75c.
Spring steel, $\frac{1}{4}$ -in. and thicker.....	5.00c.
Black sheets (No. 24).....	5.00c.
Blue ann't'd sheets (No. 10).....	4.00c.
Galv. sheets (No. 24).....	5.40c.
Struc. rivets, $\frac{1}{2}$ -in. and larger.....	5.65c.
Com. wire nails, base per keg.....	\$3.40
Cement c't'd nails, 100-lb. keg.....	3.40

quired. The Shell Oil Co. has taken no action on its inquiry for 10 80,000 bbl. tanks, calling for 3100 tons, for its Domingues plant. Bids were opened this week on 1200 tons for a pipe line at Hood River, Ore. No new inquiries of importance have come up for figures. Prices continue to range from 2.20c. to 2.25c., c.i.f., with a strengthening tendency.

Shapes.—Structural shape awards this week exceeded 5500 tons. Those outstanding were 2500 tons for a tin plate mill for the Columbia Steel Corporation at Pittsburg, Cal., placed with McClintic-Marshall Co., 2000 tons for a power house for the Great Western Power Co., San Francisco, booked by Dyer Brothers, and 170 tons for an apartment at Baywood, Cal., obtained by the Judson-Pacific Co. Bids were opened this week on 243 tons for a bridge over the Yellowstone River at Gardiner, Mont. The Illinois Steel Bridge Co. was low bidder. Pending business exceeds

10,000 tons. Plain material continues firm at 2.35c., c.i.f. Coast ports.

Cast Iron Pipe.—Demand for cast iron pipe has fallen off, though a fair-sized tonnage was placed this week. Los Angeles placed 844 tons of 8-in. Class 350 pipe with R. D. Wood & Co. through Jones-Lyman Co. and 422 tons of the same size with the Pacific States Cast Iron Pipe Co. A number of small street improvement projects in San Diego, Cal., calling for more than 225 tons, were placed this week with various interests. Only two important projects are now up for figures; these are 1284 tons of 24-in. Class B or riveted steel pipe for Seattle and 164 tons of 2 to 12-in. Class B pipe for Phoenix, Ariz.

Steel Pipe.—The Pacific Gas & Electric Co., the Southern California Gas Co. and the Pacific Lighting Co. have announced the formation of the Northern California Gas Co., with capital stock of \$5,000,000, to construct a pipe line of 210 miles from Ventura to San Jose, Cal., to transport natural gas to the bay districts. This project will require about 50,000 tons of 12 to 22-in. pipe. It is understood that the construction of the line will be begun in the near future.

St. Louis

Steel Orders Still Good Despite Recent Heavy Ordering—Pig Iron Firm—Scrap Again Advances

ST. LOUIS, Oct. 16.—Most melters in the St. Louis district are covered on their pig iron requirements for the remainder of the year, with the result that sales, which fell off this week, probably will continue to show recessions until makers open their books for the first quarter of next year. Some inquiry is being made for next quarter iron, but furnaces are not making prices for that shipment. The market is firm, and there is some talk of another advance of at least 50c. a ton. The melt in the district is heavy, and calls for iron are urgent. The stove interests are enjoying an unusually good shipping season, and foundries catering to agricultural lines are doing a heavy business. Mills specializing in railroad material report quiet business. The St. Louis Gas & Coke Corporation sold 3700 tons, including 500 tons to an implement maker, 300 tons each to two stove foundries, 300 tons to a specialty maker, 200 tons to an Illinois implement maker, and the remainder in lots of a carload up to 150 tons.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b.	
Granite City, Ill.....	\$19.50 to \$20.00
N'th'n No. 2 fdy., deliv'd St. Louis..	20.16
Southern No. 2 fdy., deliv'd.....	20.67
Northern malleable, deliv'd.....	20.16
Northern basic, deliv'd.....	20.16

Freight rates: 81c. Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

Finished Iron and Steel.—The Texas & Pacific Railway, which is in the market for 30,000 tons of rails for its 1929 requirements, and not the Missouri Pacific, as stated in these columns last week, is expected to place the business early next week. None of the railroads centering in St. Louis has indicated its requirements for next year. Steel specifications continue to reach the Granite City Steel Co. in satisfactory volume, despite the fact that during the latter part of September nearly all buyers availed themselves of third quarter contracts then existing, specifying

Warehouse Prices, f.o.b. St. Louis

Base per Lb.	
Plates and struc. shapes.....	3.25c.
Bars, soft steel or iron.....	3.15c.
Cold-fin. rounds, shafting, screw stock.....	3.75c.
Black sheets (No. 24).....	4.10c.
Galv. sheets (No. 24).....	4.95c.
Blue ann't'd sheets (No. 10).....	3.45c.
Black corrug. sheets (No. 24).....	4.15c.
Galv. corrug. sheets.....	5.00c.
Structural rivets.....	3.75c.
Boiler rivets.....	3.75c.
Per Cent Off List	
Tank rivets, $\frac{1}{2}$ -in. and smaller, 100 lb. or more.....	65
Less than 100 lb.....	60
Machine bolts.....	60
Carriage bolts.....	60
Lag screws.....	60
Hot-press. nuts, sq., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50
Hot-press. nuts, hex., blank or tapped, 200 lb. or more.....	60
Less than 200 lb.....	50

heavily against them. The demand for all classes of sheets has resulted in a large backlog and extended deliveries. If plate inquiries now pending develop into orders, a very fair tonnage will soon be on mill books. Business with structural fabricators is light.

Old Material.—Prices for old material are higher because dealers, to fill contracts, have been forced to pay more in competition with other territories. In some cases, dealers are filling contracts at losses. Mills are still holding out against the advancing market. Most of them are fairly well supplied with stocks of old material. Heavy melting steel, heavy shoveling steel, railroad springs, No. 2 railroad wrought, No. 1 busheling, cast iron borings, rails for rolling are up 25c. a ton, while iron car axles are 50c. higher, and wrought iron bars and transoms and railroad malleable are \$1 a ton up. Railroad lists include: Louisville & Nashville, 12,500 tons; Chesapeake & Ohio, 7606 tons; Atchison, Topeka & Santa Fe, 6240

tons; Southern, 6710 tons; Pennsylvania, 2136 tons; Frisco, 1000 tons; Texas & Pacific, 595 tons; Kansas City Southern, 435 tons; Nickel Plate, 39 carloads; Pullman Co. (St. Louis), 8 carloads.

Dealers' buying prices, per gross ton, f.o.b. St. Louis district:

Heavy melting steel.....	\$12.75 to \$13.25
No. 1 locomotive tires....	12.50 to 13.00
Heavy shoveling steel.....	12.75 to 13.25
Miscel. stand.-sec. rails including frogs, sw'ches and guards, cut apart...	14.00 to 14.50
Railroad springs.....	15.25 to 15.75
Bundled sheets.....	9.50 to 10.00
No. 2 railroad wrought....	12.75 to 13.25
No. 1 busheling.....	9.25 to 9.75
Cast iron borings.....	8.50 to 9.00
Iron rails.....	13.00 to 13.50
Rails for rolling.....	15.00 to 15.50
Machine shop turnings....	9.00 to 9.50
Steel car axles.....	18.25 to 18.75
Iron car axles.....	27.00 to 27.50
Wrot. iron bars and trans.	20.25 to 20.75
No. 1 railroad wrought....	11.00 to 11.50
Steel rails, less than 3 ft..	15.50 to 16.00
Steel angle bars.....	13.50 to 14.00
Cast iron carwheels.....	13.50 to 14.00
No. 1 machinery cast.....	14.50 to 15.00
Railroad malleable.....	13.50 to 14.50
No. 1 railroad cast.....	14.00 to 14.50
Stove plate.....	12.00 to 12.50
Agricult. malleable.....	11.50 to 12.00
Relay. rails, 60 lb. and under.....	20.50 to 23.50
Relay. rails, 70 lb. and over.....	26.50 to 29.00

Youngstown

Valley Mills Operating at Close to Full Capacity—Shipments Exceed Volume of New Business

YOUNGSTOWN, Oct. 16.—Not since the recovery from the 1921 depression has the steel industry in the Mahoning and Shenango Valleys enjoyed such activity as in the first half of this month. While new business, as distinct from specifications and releases on old orders, generally is lighter than in the first half of September, it is running much larger than most steel company sales managers had expected, in view of the extraordinarily heavy flow of specifying, ordering and contracting in September. It was believed that this month's business might suffer by reason of the September rush of tonnage.

With the exception of tin plate and welded standard and oil country pipe, mill schedules are filled to the end of the month at least, and in sheets and bars well into November, while ingot production remains at full physical capacity. At the Ohio works of the Carnegie Steel Co. only one or two open-hearth furnaces, of a group of 15, are idle. The Sharon Steel Hoop Co. at Lowellville has all six of its open-hearth furnaces in production. There is full operation of furnaces at both the local and Warren plants of the Republic Iron & Steel Co., and all but four of the 24 open-hearth furnaces of the Youngstown Sheet & Tube Co. are producing. Of the 26 steel works blast furnaces, 19 are active.

Plant engagement of this sort makes for optimism, but it is somewhat restrained, in that there is doubt whether the present gait can be maintained through the remainder of the

year. It is recognized that, while new business is relatively good, it is not equaling production and shipments and that inroads are being made upon the order books. There is no disposition to overlook the fact that September's rush of business was partly accountable to the higher prices named for fourth quarter business. In the desire of buyers to escape the advances, there was probably a little more ordering than actual requirements suggested. Reserve stocks of consumers have been built up to some extent.

Prices present a firm front. Makers of sheets now are uniformly quoting black at 2.75c., base, galvanized at 3.50c., base, blue annealed at 2c., base, and automobile body sheets at 4c., base. Concessions are encountered in galvanized and black sheets, but blue annealed and body sheets are firmly held by all producers. Makers believe they should get more money for body sheets because of the quality exactions of the automobile body producers. They are actually getting some net advance by insisting upon consumers taking stock that is in accordance with specifications and by refusing to accept rejections based on some of the reasons advanced by consumers. Strip makers here are considering a new single base price and a new card of extras, although it is generally realized that not much business can take the new schedule until the first quarter of 1929, as so many consumers now are under contract for this quarter.

The pig iron market shows firmness. Producers quote No. 2 foundry at \$17, furnace, basic at the same price, Bessemer at \$17.50 to \$18 and malleable at \$17.50, but only small sales are being made.

A tight situation exists here in steel works grades of scrap, as dealers sold more than they had or have since been able to buy in the face of the pronounced strength in the Pittsburgh district. The local market is regarded as \$16.50 to \$17 for heavy melting steel, \$16 to \$16.50 for compressed sheets and \$12 to \$12.50 for machine shop turnings, the three grades most commonly used here. With the Pittsburgh market fully \$1 a ton higher on the first two grades and a difference of only about 40c. between the freight on Western shipments to this market and Pittsburgh, there is the possibility of Western scrap going past Youngstown. Local mill buying would probably advance prices, but local melters have so far succeeded in avoiding purchases supplementary to those of mid-summer.

Birmingham

Tennessee Company Takes Off Five Open-Hearth Furnaces—Steel Demand Fairly Good

BIRMINGHAM, Oct. 16.—Pig iron sales the past week have been in small to moderate lots for nearby delivery. Buying is largely by quiet negotiation, and very few good-sized open inquiries are coming into the market. The volume of iron under contract for the last quarter is larger than it was at the early part of any other quarter in the past year. Shipments the first two weeks of this month have been slightly less than the weekly average for September, yet they have been about equal to production. On Oct. 7 the Tennessee company changed its Nos. 1, 2, 3 and 4 furnaces at Ensley from basic to foundry iron. The No. 2 Bessemer furnace of this company was banked on the same date. Eighteen furnaces are now in blast, of which 15

are on foundry, two on basic and one on ferromanganese.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.....	\$16.25
No. 1 fdy., 2.25 to 2.75 sil.....	16.75
Basic	16.25

Finished Steel.—Orders for the first half of the present month were better than in the first two weeks of September. With the exception of steel rails, bookings in the past four weeks have been better than for the corresponding period in the past several seasons. The market is firm. Owing to the closing down of the Ensley rail mill of the Tennessee company on Oct. 7, its open-hearth operations have been reduced by the shutting down of five furnaces there.

Seven are active at Fairfield and the Gulf States Steel Co. is working four at Alabama City. Operations of other plants in the district are at a high rate. The fabricated structural steel market is slightly more active. Pending tonnage has been increased by the announcement that bids will be opened next month for 15 bridges in Alabama. The Virginia Bridge & Iron Co. has booked 6000 tons for the new plant of the American Enka Corporation, Asheville, N. C., about half of which will be fabricated at Birmingham and the remainder at Roanoke, Va. Reinforcing steel bookings are fair. The Connors Steel Co. has an order for 315 tons for a warehouse at New Orleans.

Cast Iron Pipe.—A light volume of small orders characterizes the market. No sizable tonnages have been placed in several weeks. Present inquiries are light. Makers continue to maintain quotations of \$36 to \$37 on 6-in. and larger sizes. Shipments are equal to current production.

Coke.—Foundry coke sales are fairly satisfactory in view of the extent to which the trade is covered by contracts. Demand for domestic coke sizes is increasing rapidly. Specifications against foundry coke contracts are active. Quotations are unchanged from the \$5 base for both spot and contract coke.

Old Material.—Demand is stronger than a week ago. Sales are holding up well. No changes have been made in prices since the slight readjustment reported last week. Firmness is noted. Dealers' stocks are the lowest in several months.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel.....	\$12.50
Scrap steel rails.....	\$12.00 to 12.50
Short shoveling turnings..	8.00 to 8.50
Cast iron borings.....	8.00
Stove plate.....	13.50
Steel axles.....	19.00 to 20.00
Iron axles.....	21.00 to 22.00
No. 1 railroad wrought...	10.00 to 10.50
Rails for rolling.....	14.00 to 15.00
No. 1 cast.....	15.00
Tramcar wheels.....	13.00 to 14.00
Cast iron carwheels.....	13.00 to 13.50
Cast iron borings, chem...	13.50 to 14.00

Canada

Steel Business Continues at Satisfactory Level—Large Rail Orders Expected—Scrap Active

TORONTO, ONT., Oct. 16.—New business continues at a satisfactory level. The Canadian National and Canadian Pacific railroads have announced extensive rail laying programs for next year requiring large tonnages of rails. The rail mills at Sydney, N. S., and Sault Ste. Marie, Ont., are still in operation, orders on hand being sufficient for a month, by which time it is expected that new Canadian orders will be forthcoming. Mills report good business in other departments.

Pig Iron.—Business in this market is steady, but no outstanding purchases are reported. As many buyers are covered to the end of the year, contract placing is practically at a standstill, although two or three such orders were taken for lots under 500 tons. The demand for merchant iron for prompt delivery is active; orders for one and two car lots are numerous. About 1000 tons was closed the past week for spot delivery. Shipments are large. The iron melt is higher than a year ago. Pig iron prices are firm in both Toronto and Montreal markets.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75.....	\$23.60
No. 2 fdy., sil. 1.75 to 2.25.....	23.60
Malleable.....	23.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75.....	25.00
No. 2 fdy., sil. 1.75 to 2.25.....	25.00
Malleable.....	25.00
Basic.....	24.00
Imported Iron, Montreal Warehouse	
Summerlee.....	33.50
Carron.....	33.00

Structural Steel.—Canadian fabricators report a steady flow of new orders, which, together with orders

on their books, assure capacity operations for some time to come. Large tonnages are in prospect for bridge and building projects. The Hamilton Bridge Co. estimates production for this year for its Hamilton plant at 32,000 tons. The Sarnia Bridge Co., Sarnia, Ont., has closed a number of orders during the past few weeks, and it is expected that it will receive a portion of the steel contract for the new bridge across the St. Clair River

between Sarnia and Port Huron, Mich. Recent orders include: 500 tons of steel to the Canadian Vickers, Ltd., Maisonneuve, Que., for an office building at Craig and Cote Streets, Montreal; 400 tons to the Canadian Bridge Co., Walkerville, Ont., for Canadian Pacific bridge on Sandwich Street, Windsor; 200 tons to the Hamilton Bridge Co. for factory for National Hosiery Co. and 100 tons for N. Slater factory at Hamilton, Ont.; 100 tons reinforcing bars to Steel Co. of Canada, Ltd., for National Hosiery Mills, Hamilton; 200 tons structural steel to Dominion Bridge Co., Ottawa, for hotel at Brockville, Ont.

Old Material.—A strong spot demand continues. Movement of scrap on contracts is large. Heavy melting steel and machinery cast were the most active grades during the week, large orders coming from Toronto and Hamilton consumers. Toronto dealers offer \$9.50 per gross ton for heavy melting steel, but despite this higher price the supply is not greatly in excess of demand; machinery cast is being purchased by local dealers at \$15 per net ton. Montreal dealers now report a strong demand for scrap, with improvement in export business.

Dealers' buying prices:

Per Gross Ton		
	Toronto	Montreal
Heavy melting steel.....	\$9.50	\$7.00
Rails, scrap.....	10.00	9.00
No. 1 wrought.....	9.00	11.00
Machine shop turnings..	7.00	5.00
Boiler plate.....	7.00	6.00
Heavy axle turnings.....	7.50	6.50
Cast borings.....	7.50	5.00
Steel turnings.....	7.00	5.50
Wrought pipe.....	5.00	5.00
Steel axles.....	14.00	20.00
Axles, wrought iron.....	16.00	22.00
No. 1 machinery cast.....	16.00	16.00
Stove plate.....	13.00	13.00
Standard carwheels.....	16.00	16.00
Malleable.....	13.00	13.00
Per Net Ton		
No. 1 machinery cast.....	15.00	....
Stove plate.....	9.00	....
Standard carwheels.....	13.00	....
Malleable scrap.....	13.00	....

Buffalo

Steel Plants Continue High-Rate Operations—Scrap Market More Active and Prices Advance

BUFFALO, Oct. 16.—Pig iron inquiry has been very light, but the prices recently established are holding. While some talk of higher prices is heard, producers realize that current quotations must be tested on tonnage before there is a further increase. This week's inquiries include one for 100 tons of malleable and one for 200 tons of high manganese iron from this district and two 500-ton inquiries for foundry iron from down State melters. Full differentials are being obtained on foundry iron in carload lots. Consumers are showing little interest in first quarter iron. Eleven furnaces are in blast. The Tonawanda Iron Corporation stack is scheduled to resume about the middle of November. Shipments of pig iron on the New York State barge canal

for the week ended last Saturday were about 900 tons. Total canal shipments for the season are about 70,000 to 75,000 tons.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25.....	\$17.00 to \$18.00
No. 2X fdy., sil. 2.25 to 2.75.....	17.50 to 18.50
No. 1X fdy., sil. 2.75 to 3.25.....	18.50 to 19.50
Malleable, sil. up to 2.25.....	17.50 to 18.50
Basic.....	17.00 to 17.50
Lake Superior charcoal...	27.28

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes.....	3.40c.
Soft steel bars.....	3.30c.
Reinforcing bars.....	2.75c.
Cold-fin. flats, sq. and hex.....	4.45c.
Rounds.....	3.95c.
Cold rolled strip steel.....	5.85c.
Black sheets (No. 24).....	4.20c.
Galv. sheets (No. 24).....	4.85c.
Blue ann'd sheets (No. 10).....	3.50c.
Com. wire nails, base per keg.....	\$3.60
Black wire, base per 100 lb.....	3.75

Finished Iron and Steel.—District mills are operating at a high rate. The Lackawanna plant of the Bethlehem Steel Corporation has 22 open-hearths active and most of its finishing mills are on double turn; the Donner Steel Co. has eight open-hearths in operation, and the Seneca Iron & Steel Co. is operating at about 92 per cent on sheets. Bars and shapes are in good demand. Prices on these products are 2.05c. to 2.10c., Buffalo. Sheet prices are well stabilized at 2.75c. for black and 4c. for automobile body grade. The galvanized price is steady at 3.55c. Sheet prices are sentimentally stronger than a week ago. Sheet deliveries are being extended. The R. S. McMannus Steel Construction Co. will fabricate 500 tons of structural for a new State normal school at Newark, N. Y.

Old Material.—The market is more active. Some scattered sales of heavy melting steel, strictly No. 1 grade, at \$16.50, are reported. Opinion is that if a mill entered the market for a tonnage of this material, it would have to pay \$16.50 to \$17. There is a scarcity of scrap here owing to heavier shipments to the Pittsburgh and Youngstown districts. A good deal of machine shop turnings and hydraulic compressed sheets is going into Pittsburgh and Youngstown. A few small lots of stove plate have been sold at

\$15 and some No. 1 machinery cast at \$16 to \$16.50. A number of short sales of stove plate are reported, dealers paying \$14.75 to cover. Scrap rails are a little stronger at \$15 to \$15.50.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	\$15.50 to \$16.50
No. 2 heavy melting steel	14.00
Scrap rails	14.50 to 15.00
Hydraulic comp. sheets	14.00
Hand bundled sheets	11.00 to 11.50
Drop forge flashings	13.50 to 14.00
No. 1 busheling	14.50 to 15.50
Hvy. steel axle turnings	13.00 to 13.50
Machine shop turnings	7.50 to 8.00
No. 1 railroad wrought	13.50 to 14.00
Hvy. steel axle turnings	13.00 to 13.50
Acid Open-Hearth Grades	
Knuckles and couplers	16.50 to 17.00
Coil and leaf springs	16.50 to 17.00
Rolled steel wheels	16.50 to 17.00
Low phos. billet and bloom ends	17.00 to 17.50
Electric Furnace Grades	
Short shov. steel turnings	11.50 to 12.00
Blast Furnace Grades	
Short shov. steel turnings	11.50 to 12.00
Short mixed borings and turnings	10.00 to 10.50
Cast iron borings	10.00 to 10.50
No. 2 busheling	11.00 to 11.50
Rolling Mill Grades	
Steel car axles	18.25 to 18.75
Iron axles	21.00 to 22.00
Cupola Grades	
No. 1 machinery cast	16.00 to 16.50
Stove plate	14.00 to 15.00
Locomotive grate bars	12.25 to 12.75
Steel rails, 3 ft. and under	17.00 to 17.50
Cast iron carwheels	13.00 to 13.50
Malleable Grades	
Industrial	16.00 to 16.50
Railroad	16.00 to 16.50
Agricultural	16.00 to 16.50

of 6-in. pipe, bids on which will be opened Oct. 17. Private business continues in excellent volume. There is a firmer price situation.

Coke.—With the additional coke produced by a battery of ovens started up first of last week, producers in this territory have been able to catch up with the demand. Calls for coke, however, continue in good volume. There has been no falling off in demand from foundries, indicating a fairly good improvement in melt by New England foundries, which have prospects of another month, at least, of excellent business.

Old Material.—Heavy melting steel was in brisk demand through the past week. Sellers continue to hold back materials to some extent, evidently expecting still higher prices. Stocks are low. Shipments of pipe have been larger than in some time. No. 1 steel was firmer at \$11.25 to \$11.75, while No. 2 steel was sold at \$9.75 to \$10.25. Most of the tonnage leaving here went to Pittsburgh.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	\$11.25 to \$11.75
Scrap T rails	10.00 to 10.50
Scrap girder rails	9.50 to 10.00
No. 1 railroad wrought	10.50 to 11.00
No. 1 yard wrought	8.00 to 8.50
Machine shop turnings	6.25 to 6.75
Cast iron borings (steel works and rolling mill)	6.50 to 7.00
Bundled skeleton, long	8.50 to 9.00
Forge flashings	9.00 to 9.50
Blast furnace borings and turnings	6.25 to 6.75
Forge scrap	6.50 to 7.00
Shafting	14.50 to 15.00
Steel car axles	16.00 to 16.50
Wrought pipe 1 in. in diameter (over 2 ft. long)	9.50 to 10.00
Rails for rolling	10.50 to 11.00
Cast iron borings, chemical	9.50 to 10.00
<i>Prices per gross ton deliv'd consumers' yards:</i>	
Textile cast	\$14.00 to \$14.50
No. 1 machinery cast	15.50 to 16.00
No. 2 machinery cast	13.50 to 14.00
Stove plate	10.50 to 12.50
Railroad malleable	15.00 to 15.50

Boston

Scrap Market Continues Strong—Coke Demand Indicates Improvement in Melt—Pig Iron Firm

BOSTON, Oct. 16.—About 3000 tons of pig iron was disposed of in the New England market the past week, prices showing firmness on all transactions. The Mystic Iron Works sold about half of the total, while the remainder went to Buffalo furnaces. Several small tonnages of Indian iron also were sold. Prospects are brighter, based on the fact that machine shops are showing general activity and the stove makers are now in the midst of their heaviest producing season. New England foundries are increasing their melt.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	\$21.91
*Buffalo, sil. 2.25 to 2.75	\$21.91 to 22.41
†Buffalo, sil. 1.75 to 2.25	20.78
†Buffalo, sil. 2.25 to 2.75	20.78 to 21.28
East, Penn., sil. 1.75 to 2.25	23.65
East, Penn., sil. 2.25 to 2.75	24.15
Va., sil. 1.75 to 2.25	25.71
Va., sil. 2.25 to 2.75	26.21
Ala., sil. 1.75 to 2.25	23.16 to 25.02
Ala., sil. 2.25 to 2.75	23.66 to 25.52

Freight rates: \$4.91 all rail and \$3.78 rail and water from Buffalo; \$3.65 from eastern Pennsylvania; \$5.21 all rail from Virginia, \$6.91 to \$3.77 from Alabama.

*All rail rate. †Rail and water rate.

Cast Iron Pipe.—What promises to be the largest pipe contract awarded by a New England municipality in years is the proposed installation of a new water system at Warwick, R. I.

The project will call for 14,000 tons of 6 to 30-in. pipe. Bids will be opened on Oct. 19. The only other municipal inquiry in the district is for 100 tons

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway, squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.
Per Cent Off List	
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

Steel Scrap Up \$1 a Ton at Detroit

DETROIT, Oct. 16.—Further advances have been registered in the Detroit scrap market during the past two weeks, heavy melting steel showing an advance of \$1 per ton and blast furnace material is up 50c. per ton. Several large sales have been negotiated recently.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	\$13.00 to \$13.50
Borings and short turnings	9.00 to 9.50
Long turnings	8.00 to 8.50
No. 1 machinery cast	14.00 to 15.00
Automobile cast	19.00 to 20.50
Hydraul. comp. sheets	12.25 to 12.75
Stove plate	11.00 to 12.00
No. 1 busheling	10.00 to 10.50
Sheet clippings	8.00 to 8.50
Flashings	10.50 to 11.00

The Mary furnace, Sharon Steel Hoop Co., Lowellville, Ohio, is being equipped with a Steinbart washer.

Cincinnati

Steel Orders Satisfactory Though at Less Than September Rate—8000 Tons of Pig Iron Sold

CINCINNATI, Oct. 16.—Pig iron purchases the past week totaled approximately 8000 tons, most of which was for fourth quarter delivery. The largest individual order was for 2000 tons of foundry iron. An Evansville, Ind., melter took 500 tons of Northern and a like amount of Southern iron. Two Michigan users of Jackson County silvery iron each took 300 tons. Sales of iron on open inquiries have been small, recent major tonnages having been placed by means of private negotiation. Pending business is light. The price situation is favorable to producers, who are holding firmly to current schedules. The volume of unfilled orders at district furnaces makes unlikely any deviation from present quotations in the near future. Conditions at Ironton have not changed. One furnace interest there has no iron to offer and the other merchant producer has only small lots of various grades.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	\$18.89 to \$19.89
So. Ohio malleable	20.14 to 20.89
Ala. fdy., sil. 1.75 to 2.25	19.94
Ala. fdy., sil. 2.25 to 2.75	20.44
Tenn. fdy., sil. 1.75 to 2.25	19.94
So'th'n Ohio silvery 8 per cent	26.89

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

Coke.—Demand for by-product foundry coke has been fairly well sustained, although a prominent maker reports a slackening volume of specifications and orders. Shipments this month, however, will at least parallel those of September, and, in the case of several producers, will exceed last month's good record. Prices are showing strength. Indications are that by-product foundry coke will remain at \$7 per net ton, f.o.b. ovens, or \$9.14 delivered Cincinnati, during November, while domestic grades probably will be advanced 50c. a ton Nov. 1. A local dealer will supply 15,000 tons of beehive foundry coke to a district consumer during the next 12 months. A Chicago company is negotiating for

12,000 tons of furnace coke for its Nashville, Tenn., plant.

Finished Material.—Although bookings have not attained the level reached in September, district sheet mills are well satisfied with the volume of orders and specifications in the first half of October. Incoming business fell slightly short of production, but the accumulation of unfilled tonnage from the previous month insures the maintenance of operations at full capacity until at least Nov. 1. The well-rounded demand from all consuming lines has been especially gratifying to producers. Several of the largest automobile makers in the Detroit district have yet to place their requirements for new models, and, though sales to the public may fall off considerably, the necessity of manufacturing a substantial supply of cars for dealers assures the purchase of considerable automobile body sheet stock in the next 30 days. Prices are firm at 2.75c. to 2.85c., base Pittsburgh, for black, 2c. for blue annealed, 3.60c. to 3.70c. for galvanized and 4c. for automobile body sheets. Orders for cold-rolled strip steel have been of fair proportions. An important maker has today announced that its minimum price, effective immediately, is 2.85c., base Pittsburgh or Cleve-

land. Specifications of bars, shapes and plates have fallen off somewhat, but mills are having difficulty in making prompt deliveries. The wire goods market is quiet. Common wire nails are bringing \$2.69 per keg, delivered in Cincinnati.

Old Material.—The scrap market remains turbulent, and dealers are making every effort to acquire certain grades of material of which there is a shortage. Railroads received high prices for many of the items offered last week and a fair amount of this tonnage was bought by local dealers. District steel plants apparently are not buying for forward delivery, but nevertheless are accepting shipments on current contracts at a normal rate. That they will make purchases in the near future is the opinion in this market. Meanwhile, the entire schedule is strong at the prices quoted below.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel.....	\$13.50 to \$14.00
Scrap rails for melting.....	13.50 to 14.00
Loose sheet clippings.....	9.50 to 10.00
Bundled sheets	10.25 to 10.75
Cast iron borings.....	9.25 to 9.75
Machine shop turnings.....	8.75 to 9.25
No. 1 busheling	10.75 to 11.25
No. 2 busheling	6.50 to 7.00
Rails for rolling	13.75 to 14.25
No. 1 locomotive tires.....	13.50 to 14.00
No. 2 railroad wrought.....	13.50 to 14.00
Short rails.....	18.25 to 18.75
Cast iron carwheels.....	12.50 to 13.00
No. 1 machinery cast.....	17.50 to 18.00
No. 1 railroad cast.....	14.25 to 14.75
Burnt cast.....	10.50 to 11.00
Stove plate	10.50 to 11.00
Brake shoes	10.25 to 10.75
Railroad malleable	13.50 to 14.00
Agricultural malleable.....	12.50 to 13.00

Black & Decker Buys Motor Works

Black & Decker Co., Towson, Md., has purchased the plant of the Domestic Electric Co., Cleveland manufacturer of fractional horse power motors. The plant of the Van Dorn Electric Tool Co., Cleveland, was purchased a few months ago by the Black & Decker Co. and with the acquisition of the Domestic plant it was stated that the Maryland company becomes a self-contained unit, making all parts used in the manufacture of electric drills, hammers and other tools in its line of products. Carl A. Duffner, president Domestic Electric Co. since its organization 15 years ago, will remain as the head of that company as will also Alfred N. Kellogg, treasurer, and Milton H. Spielman, vice-president.

naces and a pickling and treating department for boiler tubes. It has a rated annual capacity of 18,000 tons and the product includes locomotive and marine boiler tubes and cold-drawn seamless tubing in sizes from ½ in. to 3¼ in. in diameter. With the plant the purchaser secures 100 acres of land. The Canton company expects to place the Wooster plant in operation shortly.

Open Meeting to Consider Steel Making Problems

A discussion of important problems in steel making has been organized for Friday, Oct. 19, by the metallurgical advisory board to Carnegie Institute of Technology and United States Bureau of Mines. As has been noted frequently in the past, these organizations are conducting an extended research into the fundamentals of steel making. Meetings held on Oct. 19 will be open to all interested listeners, and will be held in the auditorium, Bureau of Mines Station, Pittsburgh. In addition to the problems of slag formation and reaction with steel, other items for consideration will include case carburizing, X-ray investigations, and iron-manganese alloys. After an informal dinner at Pittsburgh Athletic Association, Dr. W. H. Hatfield, director of research, Brown-Firth Research Laboratories, Sheffield, England, will speak.

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes.....	3.40c.
Bars, soft steel or iron.....	3.30c.
New billet reinfrc. bars.....	3.15c.
Rail steel reinfrc. bars.....	3.00c.
Hoops	4.00c. to 4.25c.
Bands	3.95c.
Cold-fin. rounds and hex.....	3.85c.
Squares	4.35c.
Black sheets (No. 24).....	3.90c.
Galvanized sheets (No. 24).....	4.75c.
Blue ann'd sheets (No. 10).....	3.45c.
Structural rivets	3.85c.
Small rivets .....	.65 per cent off list
No. 9 ann'd wire, per 100 lb.....	\$3.00
Com. wire nails, base per keg.....	2.95
Cement c'd nails, base 100 lb. keg.....	2.95
Chain, per 100 lb.....	7.55
Net per 100 Ft.	
Lap-weld. steel boiler tubes, 2-in.....	\$18.00
4-in.	38.00
Seamless steel boiler tubes, 2-in.....	19.00
4-in.	39.00

Timken Acquires Wooster Tube Plant

The Timken Steel & Tube Co., subsidiary of the Timken Roller Bearing Co., Canton, Ohio, has purchased for \$200,000 from John C. Schultz, receiver, the Weldless Tube Co., Wooster, Ohio. This plant was built in 1922 and is equipped with a piercing mill, an automatic rolling mill and 10 stands of reducing rolls, together with heating, swaging and annealing fur-

Non-Ferrous Metal Markets

Copper Inactive But Firm, Tin Sales Moderate, Lead and Zinc Quiet and Unchanged

Copper.—Columbus Day, Oct. 12, was a generally observed holiday in this and other non-ferrous markets, and, followed by a Saturday, activity slowed down. Buying by domestic consumers is spasmodic and, where large tonnages are involved, December is the usual delivery period. A few consumers still need a little October and November metal which they seem able to obtain. Foreign sales have been larger than domestic, with November-December generally involved,

Metals from New York Warehouse

Delivered Prices Per Lb.

Tin, Straits pig.....	50.50c. to 51.50c.
Tin, bars.....	52.50c. to 53.50c.
Copper, Lake.....	16.25c.
Copper, electrolytic.....	16.00c.
Copper, casting.....	15.25c.
Zinc, slab.....	7.25c. to 7.75c.
Lead, American pig.....	7.50c. to 8.00c.
Lead, bar.....	9.25c. to 10.25c.
Antimony, Asiatic.....	13.00c. to 13.50c.
Aluminum No. 1 ingots for re-melting (guar'nt'd over 99% pure).....	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy.....	24.00c. to 25.00c.
Babbitt metal, commerc'l grade.....	30.00c. to 40.00c.
Solder, ½ and ½.....	32.50c. to 33.50c.

Metals from Cleveland Warehouse

Delivered Prices Per Lb.

Tin, Straits pig.....	53.50c.
Tin, bar.....	55.50c.
Copper, Lake.....	16.00c.
Copper, electrolytic.....	16.00c.
Copper, casting.....	15.75c.
Zinc, slab.....	8.00c.
Lead, American pig.....	7.00c. to 7.25c.
Lead, bar.....	9.50c.
Antimony, Asiatic.....	16.00c.
Babbitt metal, medium grade.....	18.75c.
Babbitt metal, high grade.....	58.00c.
Solder, ½ and ½.....	32.00c.

Rolled Metals from New York or Cleveland Warehouse

Delivered Prices, Base Per Lb.

Sheets—	
High brass.....	19.75c.
Copper, hot rolled.....	24.50c.
Copper, cold rolled, 14 oz. and heavier.....	26.25c.
Seamless Tubes—	
Brass.....	24.62½c.
Copper.....	25.50c.
Brazed Brass Tubes.....	27.75c.
Brass Rods.....	17.50c.

From New York Warehouse

Delivered Prices, Base Per Lb.

Zinc sheets (No. 9), casks.....	10.00c. to 10.50c.
Zinc sheets, open.....	11.00c. to 11.50c.

THE WEEK'S PRICES, CENTS PER POUND FOR EARLY DELIVERY

	Oct. 16	Oct. 15	Oct. 13	Oct. 11	Oct. 10
Lake copper, New York.....	15.25	15.25	15.25	15.25	15.25
Electrolytic copper, N. Y.*.....	15.00	15.00	15.00	15.00	15.00
Straits tin, spot, N. Y.	48.50	48.50	.....	48.25	48.62½
Lead, New York.....	6.50	6.50	6.50	6.50	6.50
Lead, St. Louis.....	6.32½	6.32½	6.32½	6.32½	6.32½
Zinc, New York.....	6.60	6.60	6.60	6.60	6.60
Zinc, St. Louis.....	6.25	6.25	6.25	6.25	6.25

*Refinery quotation; delivered price ¼c. higher.

though some October metal is still being bought. September statistics were quite favorable to sellers with a loss in stocks of about 3000 tons of copper in the refined and blister condition and with shipments to domestic consumers about 88,700 tons, the largest on record. Foreign shipments were about 51,300 tons, making the month's total about 140,000 tons, compared with 143,600 tons in August. Stocks of refined copper on Oct. 1 were about 51,000 tons, the lowest in many years. Prices are unchanged, with electrolytic copper selling at 15.25c., delivered in the Connecticut Valley, and with the foreign quotation at 15.50c., c.i.f., usual European ports. Lake copper is moderately active and

stocks are very low, with quotations unchanged at 15.25c. to 15.50c., delivered.

Tin.—Sales for the week ended Saturday, Oct. 13, were about 650 tons, with the market very dull. Consumers are largely absent from the market, indicating that they have ample supplies. On Monday, only about 100 tons changed hands and on Tuesday also the market was dull. Spot Straits tin on Tuesday was quoted at 48.50c., New York. Sales in London Tuesday of only 10 tons of spot and 90 tons of futures are said to have been the smallest on record. Quotations were as follows: Spot standard, £220; future standard, £218, and spot Straits, £220 10s. Arrivals

Non-Ferrous Rolled Products

Mill prices on bronze, brass and copper products are unchanged, and zinc sheets and lead full sheets are quoted at 9.75c. per lb., base, and 10c. to 10.25c., respectively.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—	
High brass.....	19.75c.
Copper, hot rolled.....	24.00c.
Zinc.....	9.75c.
Lead (full sheets).....	10.00c. to 10.25c.
Seamless Tubes—	
High brass.....	24.62½c.
Copper.....	25.50c.

Rods—	
High brass.....	17.50c.
Naval brass.....	20.25c.

Wire—	
Copper.....	17.25c.
High brass.....	20.25c.
Copper in Rolls.....	23.00c.
Brazed Brass Tubing.....	27.75c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

Sheets, 0 to 10 gage, 3 to 30 in. wide.....	
Brass, base.....	33.00c.
Machine rods.....	42.00c.
.....	34.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged customers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible.....	13.00c.	14.50c.
Copper, hvy. and wire.....	12.50c.	13.50c.
Copper, light and bot-toms.....	11.25c.	12.25c.
Brass, heavy.....	7.25c.	8.25c.
Brass, light.....	6.25c.	7.25c.
Hvy. machine composition.....	10.00c.	11.25c.
No. 1 yel. brass turn-ings.....	9.25c.	9.75c.
No. 1 red brass or compos. turnings.....	9.25c.	10.25c.
Lead, heavy.....	5.25c.	5.625c.
Lead, tea.....	3.75c.	4.25c.
Zinc.....	3.25c.	3.625c.
Sheet aluminum.....	12.50c.	14.50c.
Cast aluminum.....	11.75c.	13.50c.

Rolled Metals, f.o.b. Chicago Warehouse

(Prices Cover Trucking to Consumers' Doors in City Limits)

Sheets—	
High brass.....	19.75c.
Copper, hot rolled.....	24.00c.
Copper, cold rolled, 14 oz. and heavier.....	26.25c.
Zinc.....	10.00c.
Lead, wide.....	9.75c.
Seamless Tubes—	
Brass.....	26.12½c.
Copper.....	27.00c.
Brass Rods.....	17.50c.
Brazed Brass Tubes.....	27.75c.

thus far this month have been 1990 tons, with 8635 tons reported afloat.

Lead.—Only moderate activity is reported, consumers purchasing October-November metal. The leading interest continues to quote 6.50c., New York, as its contract price, and the prevailing quotation in the West is 6.32½c., with a little metal available from one or two sources at 6.30c., St. Louis.

Zinc.—Statistics for September showed an increase in stocks of refined metal of about 3000 tons, but this is offset by a large decrease in the number of retorts operating on Oct. 1. Quotations for prime Western are firm and unchanged at 6.25c., East St. Louis, or 6.60c., New York. Demands from consumers, however, are not heavy, although buying by galvanizers may develop in the near future. It is believed by some that their stocks are low.

Antimony.—The market is a little easier with Chinese metal for spot delivery available at 11c. to 11.25c.,

New York, duty paid, with futures holding at 10.75c.

Nickel.—Quotations are unchanged at 35c. per lb. for ingot, 36c. for shot and 37c. for electrolytic nickel in wholesale lots.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted at 23.90c. per lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Oct. 16.—Sales are more active but the bulk of business is for early delivery. Prices are steady except in tin and antimony. The old metal market is moderately active.

Prices, per lb., in carload lots: Lake copper, 15.50c.; tin, 49.75c.; lead, 6.40c.; zinc, 6.35c. in less-than-carload lots; antimony, 12.25c. On old metals we quote copper wire, crucible shapes and copper clips, 10.75c.; copper bottoms, 9.75c.; red brass, 9.50c.; yellow brass, 7.25c.; lead pipe, 4.75c.; zinc, 3.50c.; pewter, No. 1, 30c.; tin foil, 36.25c.; block tin, 45.25c.; aluminum, 12c., all being dealers' prices for less-than-carload lots.

Reinforcing Steel

Chicago Hotel Takes 1000 Tons of Bars

AWARDS of about 5200 tons of bars included 1000 tons for a Chicago hotel and 500 tons for subway construction in New York. Among inquiries totaling 3600 tons are 1200 tons for a building in Chicago for the Western Electric Co. and 500 tons for the Powhatan Hotel, Chicago. Awards follow:

NEW YORK, 500 tons, subway work; 300 tons from Carroll Co., general contractor, and 200 tons from Clementi Contracting Co., to Concrete Steel Co.
NEW YORK, 160 tons, building on Broad Street for Lee, Higginson & Co., to Carroll-McCreary Co., Inc.
NEW YORK, 120 tons, miscellaneous work in Mott Haven yards of New York, New Haven & Hartford Railroad, to Concrete Steel Co.
BROOKLYN, 110 tons, building for St. John's Law School, to Carroll-McCreary Co., Inc.
BROOKLYN, 100 tons, public school No. 96, to Tidewater Structural Materials Corporation.
HASTINGS-ON-HUDSON, 130 tons, factory building for American Brass Co., to Fireproof Products Co.
NEW CITY, N. Y., 100 tons, Rockland County Court House, to Fireproof Products Co.
HORNELL, N. Y., 100 tons, sewage treatment work, to a Buffalo maker.
NEWARK, N. J., 130 tons, Essex County Girls' Vocational School, to Tidewater Structural Materials Corporation.
HENDERSONVILLE, N. C., 150 tons, hotel, to Connors Steel Co.
LOUISVILLE, KY., 350 tons, recreation building, to Laclede Steel Co.
NEW ORLEANS, 315 tons, Atlantic & Pacific Tea Co. warehouse, to Connors Steel Co.
COLUMBUS, OHIO, 500 tons, grade crossing for Norfolk & Western Railroad, to Truscon Steel Co.
CHICAGO, 100 tons of rail steel bars, garage at Lamon and Madison Streets, to Calumet Steel Co.

CHICAGO, 1000 tons, hotel on Walton Place, to an unnamed bidder.

CHICAGO, 300 tons, building for Patterson Estate, to Jones & Laughlin Steel Corporation.

CHICAGO, 500 tons, warehouse for John Sexton & Co., to American System of Reinforcing.

CHICAGO, 100 tons of rail steel bars, apartment building at Sixty-seventh and Jeffery Streets, to Olney J. Dean & Co.

CHICAGO, 200 tons of rail steel bars, hotel at 617 West Madison Street, to Olney J. Dean & Co.

SPRINGFIELD, ILL., 300 tons of rail steel bars, State highway work, to unnamed bidder.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEW YORK, 185 tons, Evander Childs High School; John T. Brady & Co., general contractors.

NEW YORK, 110 tons, warehouse on East Thirty-sixth Street for New York Steam Corporation; Turner Construction Co., general contractor.

NEW YORK, tonnage being estimated, laboratory on Bank Street for Bell Telephone Laboratories, Inc.; Turner Construction Co., general contractor.

BROOKLYN, 400 tons, building for Brooklyn Ash Removal Co., Inc.; United Fireproofing Co., general contractor.

JERSEY CITY, 3000 tons, terminal warehouse for Delaware, Lackawanna & Western Railroad Co.; reported last week as requiring 2000 tons.

CLEVELAND, 100 tons, Cleveland Union Terminals Co.

CHICAGO, 500 tons, Powhatan Hotel.

CHICAGO, 1200 tons, building for Western Electric Co.

CHICAGO, 900 tons, six public schools.

OAKLAND, CAL., 248 tons, south spillway for East Bay Municipal Utility District; general contract to Ward Engineering Co.

OAKLAND, 100 tons, Pardee Reservoir, East Bay Municipal Utility District;

general contract to Ward Engineering Co.

SAN FRANCISCO, 675 tons, Sears-Roebuck Co. warehouse; bids being taken.

BERKELEY, CAL., 1800 tons, science building for University of California; general contract to Dinwiddle Construction Co.

SANTA CRUZ, CAL., 225 tons, hotel; general contract to Carl Swenson.

SACRAMENTO, CAL., 129 tons, highway work in Orange County; bids Oct. 30.

Railroad Equipment

Great Northern Orders 500 Steel Underframes

Orders for 500 steel underframes, for the Great Northern, and 25 dining cars, for the Southern Pacific, are the more important items of a quiet week in railroad equipment. Details follow:

Great Northern has ordered 500 steel underframes from Pressed Steel Car Co. and will build steel box car bodies in its own shops. This road has also made formal inquiry for 1000 ore cars and will soon ask for bids on 500 general service gondola cars. Preliminary announcement of these inquiries was made in THE IRON AGE of Aug. 9.

Canadian National is inquiring for 300 flat cars. This is in addition to its inquiry for 1500 box and 30 tank cars reported recently. This road is also expected to come into market for five buffet parlor, five mail and express and 10 sleeping cars in addition to 25 coaches, 15 sleeping and two combination baggage and smoking cars now under negotiation.

Maine Central has ordered four box cars from Standard Steel Car Co.

Youngstown Sheet & Tube Co. has ordered 200 mine cars from Enterprise Wheel & Car Corporation.

Southern Pacific has ordered 25 dining cars from Pullman Car & Mfg. Corporation.

Texas & Pacific will take preliminary figures on 75 caboose car underframes.

Chicago & North Western is in the market for 100 caboose car underframes.

Production of bituminous coal in the week ended Oct. 6 is reported by the United States Bureau of Mines at 11,028,000 net tons. This is about the same output as in the preceding week, which was the highest in several months. It brings production for the calendar year to 364,002,000 tons, compared with 403,157,000 tons in the corresponding portion of 1927 and 414,634,000 tons in 1926.

Orders received by the General Electric Co., for the three months ended Sept. 30, amounted to \$90,328,666, compared with \$77,420,263, for the corresponding quarter of 1927, an increase of 17 per cent. For the nine months ended Sep. 30, orders received amounted to \$260,686,463, compared with \$233,076,091, for the first nine months of last year.

PERSONAL

ALEXANDER E. WALKER, new general manager of sales for the Republic Iron & Steel Co., Youngstown, was graduated from the engineering department, University of Michigan, in 1910. He joined the Riter-Conley Co. just after completion of his college course and for almost a year was en-



A. E. WALKER

gaged in fabricated steel erection work. In 1911 he left that company to go with the La Belle Iron Works, Steubenville, Ohio, and after a brief connection with the general sales department of that company, was transferred to the Chicago district sales office. On Feb. 1, 1916, he joined the Republic company, as assistant manager of pipe sales and in 1919 was made assistant general manager of sales in charge of pipe and sheets. When the Republic sales department personnel was recast following the absorption of Trumbull Steel Co. early this year, he was made assistant general manager of sales with supervision over all products of the company.

GEORGE B. WHITWELL is president and treasurer, FRANK GOULD, vice-president and director of sales, and JOHN H. WHITWELL, secretary, of the McCaffrey File Corporation, which has been formed to take over the business and assets of the McCaffrey File Co., Fifth and Berks Streets, Philadelphia. Mr. Gould was associated for 30 years with Henry Disston & Sons, Inc., Philadelphia, and for five years with George H. Bishop & Co., Columbus, Ohio.

DR. ROBERT J. ANDERSON, vice-president Fairmont Mfg. Co., Fairmont, W. Va., arrived in New York Oct. 5, after an extended trip through Europe. He visited a number of the principal aluminum plants abroad and made a study of the foreign aluminum situation.

JOHN W. McMAHON has been appointed superintendent of the cold strip department at the Warren, Ohio, works, Republic Iron & Steel Co., succeeding H. A. FISHER, who resigned recently. Before going to Warren, Mr. McMahon was associated for 25 years with the Superior Steel Corporation, Carnegie, Pa., having served for 10 years as superintendent of the cold rolling department.

C. R. ELLICOTT, formerly superintendent Lehigh mills and furnaces, Bethlehem, Pa., plant, Bethlehem Steel Co., has been appointed assistant general manager of the Bethlehem company's Cambria plant, Johnstown, Pa. He succeeds F. A. SCAMMELL, who has resigned.

MAXIMILIAN N. BODENBACH, formerly chief engineer Electro-Mechanical Engineering Co., Milwaukee, has established offices at 502 Commerce Building, Milwaukee, for the practice of engineering advisory to manufacturers, inventors and architects on electrical problems.

A. C. DENISON has been elected president of the Fulton Foundry & Machine Co., Cleveland, succeeding A. E. GIBSON, who has resigned to become works manager of the Wellman-Seaver-Morgan Co., Cleveland. Mr. Denison was formerly connected with the Fulton foundry but for the past six years has been manager of the Euclid Foundry Co., Euclid, Ohio.

JOSEPH W. IVY, for 15 years manager of the Kansas City office of the American Cast Iron Pipe Co., Birmingham, has resigned to become Western sales manager for the National Cast Iron Pipe Co., with headquarters in the Land Bank Building, Kansas City. Control of the National company was recently obtained by James B. Clow & Sons, Chicago.

CHARLES RAMSDEN has been appointed general manager of the Pacific Coast Engineering Co., Oakland, Cal. He was chief engineer of the Western Pipe & Steel Co. from 1909 to 1919, when he resigned to become president of the Steel Tank & Pipe Co., Berkeley, Cal.

GEORGE KELMAN has joined the engineering and sales organization of the Welded Products Co., Birmingham. He has had 12 years' experience in steel tank and plate work, having been previously connected with the Petroleum Iron Works, Sharon, Pa.; the International Petroleum Co., Tampico, Mexico; the Gulf Refining Co., Port Arthur, Tex., and the Birmingham Tank Co., Birmingham.

HUGH MORROW, president Sloss-Sheffield Steel & Iron Co., Birmingham, has been made a director of the Central of Georgia Railway Co.

WILBUR B. TOPPING, whose resignation as general manager of sales Republic Iron & Steel Co., Youngstown, was mentioned in THE IRON AGE last week, has been appointed general manager of Western sales for the Bethlehem Steel Co., with headquarters at Pittsburgh. He has been active in the steel industry for 21 years. He attended Lehigh University for two years and then transferred to the University of Pennsylvania, from which he was graduated in 1907. He then went into the operating department of the Tennessee Coal, Iron & Railroad Co., Birmingham, serving for two years in various capacities, in which he acquired a thorough knowledge of the manufacture of iron and steel. He was transferred in 1909 to the Pioneer furnaces of the



W. B. TOPPING

Republic company at Thomas, Ala., and a little later to the Youngstown mills. In 1911, he went into the sales department of the company in the general offices, then located in Pittsburgh, and in 1912 was sent to the company's New York sales offices. That year he opened and was first manager of the Philadelphia district sales office, holding this position until 1914, when he was appointed Cleveland district sales manager, with the offices at Detroit and Buffalo under his jurisdiction. Later that year he was promoted to assistant general manager of sales, with headquarters in Youngstown and, in 1919 was advanced to the position he recently relinquished.

EUGENE J. MANN, formerly with the Independent Foundry Co., Portland, Ore., has purchased the Vancouver Iron & Steel Co., Vancouver, Canada, of which concern he is now president and treasurer. He is secretary of the board of the Oregon Manufacturers' Association, and was formerly president of the United Metal Trades.

CALVIN R. MCGAHEY has been appointed to the sales engineering force of the Hill Clutch Machine & Foundry Co., Cleveland. He has specialized in the handling of power transmission equipment in the Southern section of the country, which territory he will cover for the Hill company, the territory comprising Virginia, Tennessee, North and South Carolina, Georgia, Alabama, Florida, Mississippi and Louisiana.

CHARLES WARDLOW, head of S. & C. Wardlow, Sheffield, England, otherwise known as the Portobello Steel Works, makers of crucible steel



CHARLES WARDLOW

and rustless iron; particularly sheets for cutlery and saws and steel for files, made a hurried visit to the United States, chiefly to visit the exposition at Philadelphia last week of the American Society for Steel Treating. He reports expanding sales, including business with the United States and on the Continent, and a

generally improved outlook with no labor troubles in England in prospect. He sailed for England on Oct. 13 after being barely a week in America. He was accompanied at Philadelphia by Sears and King Hoyt and V. A. Greene, all of the Edgar Allen Steel Co. and A. Milne & Co., New York, who represent the Wardlow company in the United States.

L. P. ROSS, who has been at the Newcastle, New South Wales, plant of the Broken Hill Proprietary Co., Ltd., as consulting engineer for nearly two years, returned to New York this week. His work at Newcastle was chiefly the modernizing of the Broken Hill Company's blast furnaces. For several years previous to 1926 Mr. Ross was vice-president in charge of operations of the Replogle Steel Co. at Wharton, N. J.

R. J. WORKING has been appointed district sales manager for the Cincinnati district, with headquarters at 1320 Union Trust Building, that city, for the Central Alloy Steel Corporation. For some years he has been associated with the corporation's sales department at the general offices at Massillon, Ohio. He succeeds J. O. DEARTH, who has resigned.

ARTHUR G. EATON, recently elected vice-president and director of sales of the Aluminum Industries, Inc., Cincinnati, is in charge of general sales offices opened by the corporation in the Fisher Building, Detroit. For 15 years Mr. Eaton was connected with Dodge Brothers, Inc., the last four as director of the purchasing department. Heretofore Aluminum Industries has been represented in Detroit by B. J. PLUMLEY, engineer, serving in a technical capacity. Mr. Plumley will be associated with Mr. Eaton.

sults of the crucible test should not be taken as indicative of the ease with which coke made from it can be pushed out of the oven, since, although they do show abnormal swelling with coals which stick in the retort, the sticking is due rather to failure to shrink than to swelling during coke formation.

Rubber Binders Developed for Foundry Cores

A foundry core sand binder, using rubber as its basis, has been developed by the United States Bureau of Standards, Washington.

The outstanding advantages of the binder, according to the *Technical News Bulletin* of the Bureau, are:

The cores crush readily, falling to loose sand of their own accord, so that the core sand may be poured from the casting instead of having to be dug out.

The cores have greater strength

than green sand cores and extend the range of jobs to which a readily crushed core may be applied.

The cores are not oven baked; they are merely air-dried.

The cores are of high permeability and show remarkable freedom from blowing.

The rubber core binder consists, essentially, of a solution of unvulcanized rubber in gasoline. The amount and type of rubber binder used in making cores depend upon the type of core sand, the size of the core and the metal to be cast around it. A core strength equivalent to that of green sand cores or baked oil sand cores can be attained by the use of the rubber binders. The new binders have proved to be successful in producing sand cores for castings of lead, tin, zinc, brass, phosphor-bronze, bronze, aluminum, iron and steel.

The rubber types of binders are discussed in considerable detail in Letter Circular No. 252, "Rubber Binders for Foundry Cores," which is now ready for distribution.

New Otis Steel Furnace

The Otis Steel Co., Cleveland, shortly will begin the erection of another open-hearth furnace, the third to be built this year. With the completion of this furnace the company will have a fully rounded out steel plant with eight open-hearth furnaces at its Riverside plant, which together with five furnaces at its Lakeside plant will give it an annual capacity of 840,000 tons of steel ingots or sufficient to supply all the semi-finished steel required for its finishing mills.

Obituary

SILAS M. HAIGHT, for several months research engineer Sweet's Steel Co., Williamsport, Pa., was killed Sept. 30 in an automobile accident near Liverpool, Pa. He was a graduate of Lafayette College, Easton, Pa., and before going with the Sweet's company, had been associated with the Highway Products Mfg. Co., Elmira, N. Y.

EDWARD H. SWINDELL, treasurer of William Swindell & Brothers, Pittsburgh, builders of steel works and glass plant furnaces, died at his home in that city, Oct. 11. Mr. Swindell was 61 years old and had been identified with this company, of which his father was one of the founders in 1853, during his entire business life. He was also president of the American Dresser Tunnel Kilns, Inc., and of the New Castle Refractories Co. He was a member of the American Iron and Steel Institute.

Gas manufactured in the East St. Louis and Granite City, Ill., plants of the Illinois Power & Light Corporation, will be piped to Staunton, Mount Olive and Carlinville, Ill., by the way of Edwardsville, a distance of more than 50 miles.

Swelling of Coal During Rapid Coking

It is common knowledge that the semi-bituminous coals give trouble from sticking of the coke in the retort or even after carbonizing. This is probably because the cokes do not shrink appreciably during the latter stages of carbonization, as do those from coals higher in volatile matter. Abnormal swelling during coke formation would cause sticking, but this is not observed with semi-bituminous coals when coked at normal rates.

Experiments at the United States Bureau of Mines' Pittsburgh experiment station have shown, however, that even semi-bituminous coals can be made to swell when coked at extremely rapid rates, as in the crucible coking test. If the temperature is raised to 900 deg. C. in 1 min. a strongly swollen button will result, whereas with the higher volatile coals swelling is not so pronounced. Re-

Spain Making Industrial Progress

Visit of Iron and Steel Institute of Great Britain Gives
Evidences of New Stabilization—Two American
Steel Men in Group Received by Queen

BILBAO, SPAIN, Sept. 27.—After an interval of 32 years, the British Iron and Steel Institute came again to Bilbao for its second autumn meeting. Four members who participated in the earlier visit were present, among them Past-president F. W. Harbord, who, in 1896, presented a paper in conjunction with T. Twyman on "The Presence of Fixed Nitrogen in Steel." Another of the "veterans" was H. Spence Thomas, a prominent South Wales tin plate maker, who enlivened a long and tedious rail journey with pleasant reminiscences of the 1896 meeting.

In the hospitality extended to the hundred members who made the journey, the Spanish meeting compared very favorably with meetings held in other countries, and those who remember the institute's visit to Sweden two years ago know that no greater compliment could be paid to the Spanish hosts than by making this comparison. The main party left London on Sept. 21, which gave a whole day in the beautiful seaside resort of San Sebastian, the capital of the province of Guipuzcoa. Here, a delegation from the institute, headed by President Benjamin Talbot, was received by the Queen of Spain and by the Queen Mother. Two American members were chosen to join this delegation—C. S. Robinson and Mrs. and Miss Robinson of Youngstown, and R. H. Irons and Mrs. Irons of Harrisburg, Pa. The members were also received by the Provincial Government of Guipuzcoa and the municipality of San Sebastian, and a happy day spent in delightful surroundings was appropriately concluded with a dinner and dance given by the provincial and municipal authorities, and the works of the Province of Guipuzcoa. Monday was devoted to a tour by motor from San Sebastian to Bilbao, and en route the party visited the car works at Besain and an exhibition of art metal work at Eibar.

Spain Making Industrial Progress

The arrival in Bilbao was marked by the same cordiality, and here it was possible to notice the steady development that has been going on in the country during recent years. The present regime in Spain has an excellent record of achievement, and under its control order and prosperity now reign where there were confusion and waste. Spanish finances have been set in order; revenue now exceeds expenditure, and the country has money for investment. Rail-

roads, highways, harbors, canals, and the rivers are being developed. Labor has been organized on a cooperative plan, and there is machinery for preserving peace in industry.

The hub around which revolves the system of government-controlled industry and trade is the National Economic Council, created in 1924. Each trade and industry has its council, whose representatives sit on the National Industrial Council. This body can refuse permission for the establishment of a new industry, or even in some cases grant entrance permits for machinery free of duty. It controls the customs tariff and valuations and dictates its policy to the ministerial departments.

Ore and Steel Output Increasing

It has often been stated that the iron mines in Vizcaya were nearing exhaustion, but today this condition seems little, if any, nearer than in 1896. The output during that year amounted to 5½ million tons, and in 1913 it jumped to 9½ million tons, but it declined to 3¼ million tons in 1926 to advance again to just under 5 million tons in 1927. Pig iron output, which in 1896 amounted to 297,000 tons, advanced during 1927 to 612,000 tons, and iron and steel output rose from 100,000 tons in 1896 to 600,000 tons in 1927. There are 93 shipping companies in Spain with a total capital of 400 million pesetas in shares and 221 million pesetas in debentures. The gross steam tonnage in 1896 was 485,441 tons; in April, 1928, it was 1,127,037 tons. The electrical development in the country will, when completed, give an output exceeding 2500 million kilowatts, which is equivalent to 2500 million tons of coal. The total wealth of Spain is estimated at 220,000 million pesetas; mining accounting for 7000 million, industrial production 48,000 million and railroads for 5000 million pesetas.

Civic Authorities Welcome Visitors

The opening meeting of the conference, held on Sept. 25, at the Alfonso XIII High School, was attended by high civic authorities, and was addressed by the president of the Bilbao reception committee, Count de Zubiria, director of the Altos Hornos Co. of Vizcaya, and Senor D. Alfonso de Churrua, assistant manager of the Altos Hornos Co. In extending a cordial welcome to the visitors, they spoke of the high industrial development in Spain.

The president of the institute, Ben-

jamin Talbot, in thanking the hosts, mentioned that the excellent quality of the steel made in Spain during the Middle Ages was attested by the fact that in Shakespeare's day the word "bilbo" meant rapier. Mr. Talbot pointed out that the beginning of systematic exploitation of Spanish ores coincided approximately with the rise of the Bessemer process. It was in that period that Bessemer steel rails were introduced. Owing to the great railroad developments, the demand for Bessemer steel rails increased so rapidly that, unless an ample supply of the very pure ores of the Bilbao district had been obtainable, it would have been impossible to keep pace with the demand. Notwithstanding the approaching exhaustion of some of the better mines, the prosperity of Bilbao had not declined, and there had sprung up a number of new prosperous manufacturing industries, for the maintenance and conduct of which the local conditions were well adapted.

Visits to Steel Works

The remainder of the meeting was devoted to a reading of a selection of papers, after which there was a reception at the Town Hall by the Lord Mayor of Bilbao, followed by a luncheon party at the Bilbaina Club, with the mining companies of Vizcaya as hosts. In the afternoon the members were conveyed by launch to the steel works of the Altos Hornos Co. at Sestao, then by special train to the Baracaldo works of the same company, which is near the Geldarmes mining area, from which it draws a portion of its ore and limestone.

The Baracaldo works was founded in 1854. It is equipped with five batteries of coke ovens of the Solvay and Carves types, with a production of 80 tons per 24 hr. for each battery. There is a group of four blast-furnaces, each furnace giving an output of 250 tons of metal per day, which is converted by the Bessemer process. Three basic open-hearth furnaces are nearing completion. The electrically driven cogging mill has rolls of 2,750 x 1,941 mm., and can treat ingots of from two to five tons, rolling them into slabs down to 300 x 300 mm. The reversible mill has four stands, on which, in addition to the flats, beams up to 700 mm., rails up to 50 kilos, and angles from 150 x 100 mm. can be rolled. Power is obtained from steam generators using waste gases from the blast furnaces and the coke ovens.

The Altos Hornos Co. has devoted

considerable attention to welfare work among its employees, providing schools for children, a savings bank, hospitals and a pension fund for the widows and orphans of employees.

Iron Mines Are Inspected

On Wednesday, Sept. 26, the iron mines of the Orconera, the Franco-Belga and Dico & Setares were visited. The principal features of these mines were described in Mr. Balzola's paper and it is unnecessary to refer to them again except to point out the wide expansion of mechanical conveying. The party then returned to Bilbao, when the afternoon was devoted to the further reading of papers. In the evening the members were entertained at a dinner and dance at Las Arenas by the Metallurgical Works of Vizcaya.

The concluding day of the conference was spent in visiting works in the neighborhood of Bilbao. One party visited the Basconia works which, beginning in 1893 with the manufacture of tin plate, has since added structural iron and steel work departments and sheet and plate mills. At the Echevarria works, the visitors saw the manufacture of high-speed tool steels and alloy steels as well as horseshoe nails and iron and steel wire. Babcock & Wilcox own a large works at Galindo for the manufacture of water tube boilers, railroad material, welded steel tubes (hot and cold drawn), and constructional material. The Construction Naval works which was visited is confined to shipbuilding, the construction of steam turbines and Diesel engines. Large forgings and castings for naval and armament purposes are constructed at the Reinosa works, which was not open to inspection. According to information supplied by Count de Zubiria, the foundry at Reinosa is equipped with three open-hearth and five electric furnaces, the first for the production of mild steel and the latter for nickel and chrome-nickel steels. In the forge shop are two Davy presses of 1000 and 3000 tons as well as reheating furnaces with capacity for 30 tons of ingots. In the rolling plant there is a 21-in. reversible mill constructed for rounds and squares, while two new sheet mills are being built.

Tour Extended to Madrid

At the conclusion of the Bilbao meeting, a tour was made further south in Spain. The party spent a week-end in Madrid, some of the members going on to the famous Sagunto works owned by Sota & Aznar, Ltd. The plant here was designed by Frank C. Roberts & Co. of Philadelphia, and the three mills in operation are capable of giving an annual output of 300,000 tons. Another party visited the ancient city of Toledo with its notable and artistic monuments bearing silent witness to the national greatness and power in centuries gone by. Here the party visited the Arms Factory. At Cordoba, still bearing traces of the

Roman and Arab occupations, a visit was paid to the copper works of the Compañia Electromecánica de Cordoba.

On the whole, the Spanish visit of the Iron and Steel Institute was as enjoyable as it was interesting. The impression brought back by the visitor to Spain is that of a nation determined to attain a leading position among producing countries, and, after satisfying its own requirements, to seek outlets in the markets of the world. Spain is steadily progressing along this path.

New Plan for Program of Blast Furnace Meeting

At the fall meeting of the Eastern States Blast Furnace and Coke Oven Association, to be held at the Shannopin Country Club, Ben Avon, Pa., Oct. 26, there will be a single round table discussion of coke oven and blast furnace topics. At other recent meetings of the association, separate gatherings have considered each division of its activities. The new arrangement is intended to permit wider interchange of ideas between those responsible for blast furnace operation and those in charge of coke plants than has been possible when separate sessions were devoted to blast furnaces and coke plants.

The program provides for luncheon at the club at noon, to be followed by the joint round table discussion, at which A. E. Maccoun, superintendent of blast furnaces Edgar Thomson works, Carnegie Steel Co., Braddock, will preside. Subjects listed for discussion are:

Comparison of practice and efficiency of the modern large blast furnace with the smaller furnace.

Discussion on distribution.

Coke made from high volatile coals versus coal made from a mixture of high volatile coals.

Furnace losses.

Improvements in blast furnace refractories.

Power, efficiency, and available surplus.

The relation between size of large bell and stock line diameter and its bearing on flue dust losses.

Recent improvements if any in blast furnace and coke oven refractories.

Following the dinner in the evening there will be a discussion of stream pollution, with special reference to coke plant wastes, to be participated in by W. L. Stevenson, chief engineer Pennsylvania State Department of Health; F. H. Waring, chief engineer Ohio State Department of Health; E. S. Tisdale, director division of sanitary engineering West Virginia State Department of Health, and F. W. Sperr, Jr., Koppers Co., Pittsburgh, and chairman phenol committee of the association.

Harry Saxer, assistant general superintendent Aliquippa works Jones & Laughlin Steel Corporation, is chairman of the committee of arrangements for the meeting, the other members of which are Douglas E. Price, Koppers Co., Pittsburgh; R. H.

Schaller, Jones & Laughlin Steel Corporation, Aliquippa, Pa., and H. M. Crossett, Bethlehem Steel Co., Johnstown, Pa.

Carnegie, Pa., Scrap Rate May Be Reduced

WASHINGTON, Oct. 16.—Rates on iron and steel scrap from Carnegie, Pa., to Weirton, W. Va., and Steubenville, Ohio, will be reduced to \$1.13 from \$1.39 per gross ton and to 76c. from a former rate of \$1.39 from Weirton and Steubenville to Carnegie if the Interstate Commerce Commission approves a report made public last Wednesday. The report, prepared by Examiner W. R. Brennan, based on a complaint by Charles Dreifus & Co. and other scrap dealers in Pittsburgh against the Pennsylvania Railroad. The 76c. rate from Weirton and Steubenville to Carnegie, the examiner held, was applicable from Jan. 15, 1927, and Sept. 1, 1927 respectively. The railroad contended that the 76c. rate did not apply on scrap but that it applied only on various kinds of billets and slabs in its tariff. The \$1.39 rate is the billet rate from Carnegie to Weirton and Steubenville, while the rate of \$1.13 is the pig iron rate from Carnegie to the latter two points. Award of reparation to the complainants was recommended by the examiner.

Studies Hand-to-Mouth Buying Practices

WASHINGTON, Oct. 16.—The Institute of Economics has completed the first draft in connection with a scientific study it has made on "Iron and Steel in Relation to the Tariff." The draft is now being revised by the council of the institute.

It will be three months or more before the institute completes its study on "hand-to-mouth buying" which is designed to check up on the reported widespread change in purchasing methods during the past 10 years. Purchasing agents are being asked how far ahead their companies have been in the habit of placing orders for two of the more important commodities purchased in 1914, 1918, 1922, 1924, 1926 and 1928; what proportion the approximate average inventory for those years has been of the year's needs; whether there has been any important change in inventories carried in proportion to annual requirements; whether there has been any definite improvement in purchasing technique during the past five years; whether buying is more frequent and in smaller quantities, and, if so, why. Iron and steel share prominently in the study, inquiries being sent out to 120 or 125 purchasing agents to ascertain size of orders placed, how far they are placed in advance of use as compared with previous periods, etc. Prices, unfilled tonnages, and other information also are being compiled.

Continental Prices Decline Slightly

Some Mills Grant Concessions—Export Rebates Spread in Europe—
Welsh-German Tin Plate Agreement Possible

(By Cable)

LONDON, ENGLAND, Oct. 15.

CLEVELAND pig iron makers have lost 15,000 tons of foundry iron for Scotland to Midland furnaces, at about 2s. (49c.) less than their agreed price. Export demand is poor and in general the domestic market is inactive, but prices are being maintained as output is held at an agreed maximum. Increased demand would necessitate blowing in additional furnaces.

Hematite iron is steadier and consumers show more interest in buying, so that some sales have been effected for first quarter delivery. Gjers, Mills & Co. are to resume operation of their Aysome works, with two furnaces in blast, in January. Foreign ore is quiet, with prices unchanged.

Finished steel is quiet in the ordinary merchant export trade, but moderate tonnages of steel are involved in Indian Government railroad contracts. Rolling mills buying their semi-finished steel in the open market have strengthened quotations because of the higher cost of their raw materials. Heavy plate mills need tonnage to maintain steady operation.

Tin plate is quieter and mills calling for next year delivery are accepting 18s. 3d. (\$4.43) per base box, f.o.b. works port. The current rate of output is down to 80 per cent of capacity, but mills are well booked for forward delivery, and some have sold half their production to next June.

Galvanized sheets are active in most markets, except India, and mills generally are well engaged to the end of November. There is some Japanese demand for light-gage black sheets, which is being filled by merchants with contracts, most mills being too well filled to ship before the end of the year.

September exports of pig iron were 30,000 tons of which the United States received 9600 tons. Total exports of iron and steel were 295,000 tons. Imports also decreased with the total September arrivals of all kinds, 185,000 tons.

The Continental situation is uncertain as some makers are reported more inclined to grant concessions and prices generally have receded slightly from the recent peak. The German Semi-Finished Steel Syndicate is a keen seller. Overseas demand for finished steel has diminished.

wages of 15 pf. (3.57c.) an hour. The Ingot Steel Syndicate has announced that no advance in prices will be made because of the impending 11 per cent increase in railroad freight rates, but states at the same time that prices will be marked up immediately if wages go up.

To determine the extent that prices have risen since January it is necessary to place sales of steel in three classifications, export, domestic and sales to exporting manufacturers receiving rebates. In the first six months of the year about 50 per cent of the production of steel was delivered to domestic users, about 33 per cent was sold for export and about 17 per cent went to exporting manufacturers. On the basis of prices obtained from the three classes of consumers, the average sales price increased 15 m. (\$3.57) per ton for bars, 7.50 m. (\$1.78) per ton for structural shapes, 9.50 m. (\$2.26) per ton for heavy sheets and 13 m. (\$3.09) per ton for medium gages of sheets.

Following the recent increase in export prices of steel, rebates of the Ingot Steel Syndicate for October have been reduced, as follows:

	October Rebate per Ton	September Rebate per Ton
Ingot steel	14 \$3.33	17 \$4.05
Billets	15 3.57	19 4.52
Slabs	14 3.33	20 4.76
Light rails	37 8.80	40 9.52
Structural shapes	32 7.62	34.50 8.21
Bars	30 7.14	35 8.33
Heavy sheets	17 4.05	22.50 5.36
	24 5.71	28 6.66

The pig iron market is quiet and prices show a tendency toward weak-

German Sales Prices Show Increase

Labor Demands 15 Per Cent Advance in Wages—Steel
Production Still Large

BERLIN, GERMANY, Sept. 27.—The Metal Workers' Labor Union claims that producers have reaped large

profits from their advances of domestic and export prices in January and May and is demanding an increase in

British and Continental European prices per gross ton, except where otherwise stated, f.o.b. makers' works with American equivalent figured at \$4.86 per £ as follows:

Durham coke, del'd.	£0 17½s. to £0 17½s.	\$4.25 to \$4.31
Bilbao Rubio ore*	1 2 to 1 2½	5.35 to 5.48
Cleveland No. 1 fdy.	3 8½ to 3 9½	16.64 to 16.89
Cleveland No. 3 fdy.	3 6	16.04
Cleveland No. 4 fdy.	3 5	15.80
Cleveland No. 4 forge.	3 4½	15.63
Cleveland basic (nom.)	3 5	15.80
East Coast mixed.	3 10	17.11
East Coast hematite.	3 10½	17.23
Rails, 60 lb. and up.	7 15 to 8 5	37.66 to 40.10
Billets	6 2½ to 6 15	29.77 to 32.81
Ferromanganese	13 15	66.83
Ferromanganese (export)	14 0	68.04
Sheet and tin plate bars, Welsh	6 0	29.16
Tin plate, base box.	0 18 to 0 18½	4.37 to 4.43
Black sheets, Japanese specifications	13 7½	65.00
Ship plates	7 12½ to 8 2½	1.63 to 1.74
Boiler plates	9 0 to 10 10	1.92 to 2.25
Tees	8 2½ to 8 12½	1.74 to 1.84
Channels	7 7½ to 7 17½	1.58 to 1.69
Beams	7 2½ to 7 12½	1.53 to 1.63
Round bars, ¾ to 3 in.	7 5 to 7 15	1.55 to 1.66
Steel hoops	9 0 to 10 0	1.92 to 2.14
Black sheets, 24 gage.	10 0	2.14
Galv. sheets, 24 gage.	13 10 to 13 15	2.93 to 2.98
Cold rolled steel strip, 20 gage, nom.	16 0	3.42

*Ex-ship, Tees, nominal.

Continental Prices All F.O.B. Channel Ports (Per Metric Ton)

Foundry pig iron (a):				
Belgium	£3 3s. to £3 5s.	\$15.31 to \$15.80		
France	3 3 to 3 5	15.31 to 15.80		
Luxembourg	3 3 to 3 5	15.31 to 15.80		
Basic pig iron (nom.):				
Belgium	3 3	15.31		
France	3 3	15.31		
Luxembourg	3 3	15.31		
Coke	0 18	4.37		
Billets:				
Belgium	5 1	24.54		
France	5 1	24.54		
Merchant bars:				
Belgium	6 3½	1.36		
France	6 3½	1.36		
Luxembourg	6 3½	1.36		
Jolts (beams):				
Belgium	5 4	1.14		
France	5 4	1.14		
Luxembourg	5 4	1.14		
Angles:				
Belgium	6 0	1.30		
¾-in. plate:				
Belgium (a)	6 14	1.48		
Germany (a)	6 14	1.48		
¾-in. ship plate:				
Belgium	6 9	1.42		
Luxembourg	6 9	1.42		
Sheets, heavy:				
Belgium	6 1	1.33		
Germany	6 1	1.33		

(a) Nominal.

ness. Exports of pig iron in the first half of this year were only 13 per cent of the total sales of the Pig Iron Syndicate, compared with 16 per cent in the first half of 1927 and 31 per cent in the same period of 1926.

Expectation of a rise in the steel prices has brought out considerable buying, and mills are in most cases booked for six to eight weeks in advance. The proportion of foreign to domestic steel orders is increasing. The decline in steel output from the high rate of 1927, when production exceeded 1926 by 4,000,000 tons, has been extremely small. The average output per working day in the first eight months of this year was 51,500 metric tons, compared with 52,900 tons in the same months of 1927. In rolled products, the average output per working day this year has been 40,800 tons compared with 41,700 tons in 1927.

At the recent meeting of the European Rail Makers' Association prices were advanced 2s. 6d. (61c.) per ton. Renewal of the association agreement, which expires March 31, 1929, will be discussed in December. The medium and heavy sheet association agreement has been renewed until Dec. 31, and the present base price on sheets of 165 m. (\$39.27) per ton, f.o.b. Essen, has been retained. Efforts are being made to replace the present loose agreement of sheet producers with a syndicate, and it is understood that the 13 mills have agreed to quota participation. Of a total output of 207,435 metric tons of sheets, the following quotas are suggested as a basis for the syndicate: Mitteldeutsche

Stahlwerke, 54,850 tons; Vereinigte Stahlwerke, 29,041 tons; Heinrichshuetten 21,252 tons, and Gutehoffnungshuetten 19,452 tons.

At the recent meeting of the International Tube Cartel, members were unable to reach an agreement on an increase in tube prices. Great Britain is not expected to join the cartel until the British Government has established a tariff on tubes. At present the chief members are Germany, with a quota of about 60 per cent, France and Belgium, with 26 per cent, and Czechoslovakia, with 11 per cent.

Stockholders of the Mannesmann Tube Corporation have voted to increase the capital stock by 25,000,000 m. (\$5,950,000) to 165,000,000 m. (\$39,270,000). The new capital is to be used to develop the company's works at Huckingen, on the Rhine River, between Düsseldorf and Duisburg. It is planned to produce more raw material, needed by the tube mills; pig iron output will be expanded to about 600,000 tons annually.

Exports of machinery have gained. German manufacturers are making rapid progress in sales of machinery to Eastern Europe. Domestic demand for agricultural implements is expected to be large this year, as crops have been good, the yield of cereals being estimated at 10 to 11 per cent greater than in 1927. Exports of agricultural machinery to Russia, however, have declined considerably. Russian purchases of textile machinery and machine tools are about 12 times those of 1925, and of miscellaneous machinery, about five times.

being put on the ways is small and heavy plate mills continue in need of orders.

The agreement recently reached between the United States and Welsh tin plate makers for the regulation of sales to certain export markets has provoked some criticism, although the plan as a whole has been received favorably by the Welsh trade. It is reported that similar negotiations are pending between Wales and Germany, but at present no definite information is available. The tin plate trade is in a sound condition, and Welsh makers are assured of steady operations for some months.

Shortage of Fuel and Ore Limits Japan's Future in Steel

WASHINGTON, Oct. 11.—Difficulty in obtaining satisfactory coke at a reasonable price is the outstanding problem of the Japanese iron and steel industry, according to J. H. Ehlers, assistant commercial attaché, in a bulletin issued by the Department of Commerce. Japan has an abundance of coal, but not of a type producing good coke. With blast furnace coke at more than 15 yen (\$6.87) per ton, it is difficult to see, Mr. Ehlers states, how pig iron can be economically produced, unless great savings are effected in labor or other costs.

The iron mines of Japan proper produce but a small proportion of the total ore consumption of the country. In 1927, Japan, Chosen and South Manchuria produced 1,212,000 tons of ore, of which only 159,000 tons came from mines in Japan. The production of South Manchuria was half the total although its ores are of much lower iron content than the others.

Besides imports of ore from Japanese controlled territory, large quantities are brought in each year from the Yangtze Valley in Central China and from the Malay States. The mines in both these areas are controlled by Japanese interests. Little ore, according to Mr. Ehlers, is imported from sources not controlled by Japanese capital. The thoroughness with which sources of supply from Asiatic ore properties have been built up is shown by the growth of iron ore imports, which have nearly quadrupled in the past 16 years. The Japanese have increased the production in all the areas which they control and have been able to insure an increasing supply, despite fluctuations in the flow from certain individual sources.

While sufficient for its iron and steel industry as it now exists, Japan's ore reserves are insignificant when compared with those of the large iron and steel producing countries of the world. Reserves in Japan proper and Chosen amount to about 100,000,000 tons, while South Manchuria has about 750,000,000 tons. These figures compare with 10,000,000,000 tons of high-grade ore in the United States, about 8,000,000,000 tons in France and 1,000,000,000 tons in Germany.

Tariff Protection Nearer in Britain

Mills Rolling Foreign Steel Would Be Affected—Welsh Tin Plate Makers May Negotiate with Germany

LONDON, ENGLAND, Sept. 29.—Interest in the iron and steel trade is now centered in the possible introduction of "safeguarding" by the Government. It has been known for some time past that the Premier was being pressed by certain Conservative members to apply this measure to the iron and steel trade, but it was thought that he would refuse. At the Conservative conference at Yarmouth this week, however, Mr. Baldwin announced that no industry would be prevented from applying for protection, which means that the case for safeguarding will be considerably strengthened. The value of such a measure seems to be an open question. It is regarded as certain that one of the largest industries of the country, rolling mills using foreign semi-finished steel, would be seriously affected, and the trade in galvanized sheets would be jeopardized. Meanwhile, although fall business should be developing, there is no indication of any substantial improvement in iron and steel orders.

A factor that is likely to have an important bearing on market conditions is the continued firmness of Continental markets, which has sharply restricted imports of steel into this country to a large extent. But it is export business that is required, and because of the lack of it, makers' order books are far from well filled. Pig iron producers in the Cleveland district are moderately busy and are able to dispose fully of their restricted output, but in other districts there are still substantial stocks. A few sales for export are recorded, but the demand is not strong and competition is keen. Continental pig iron is no longer coming into this country for consumption here, as the price is not competitive, and it is reported from the Continent that the domestic demand there is fully able to absorb output.

In the finished steel market, British consumers of construction and engineering material are supplying mills with a fair volume of work, but the tonnage of new shipbuilding that is

Foreign Steel Deliveries Extended

Mills Ask Several Months' Delay—Exporters Foresee Lower Delivered Price on Tin Plate from New California Mill

NEW YORK, Oct. 16.—Importers of European steel are still offering small lots of certain sizes of shapes, most of which they purchased some time ago at prices below the present Continental market. Recent quotations by European mills have ranged from 1.75c. to 1.85c. per lb., base, on shapes and from 1.95c. to 2c. per lb., base, on plain steel bars of ordinary Thomas grade. In addition, deliveries are becoming more extended and some foreign mills are unwilling to accept new business except for delivery at their convenience, which might mean several months' delay.

Export trade continues small, particularly with the Far East, most current inquiries being for small lots of tin plate and certain specialties. Demand for second-hand plates from China has declined considerably in recent weeks, and the explanation of Chinese importers is the cessation of

hostilities. When warfare was active, such plates were used for street barricades, and were placed against windows and even the walls of rooms to make them bullet-proof. In some small communities, according to the importers, a single building would be barricaded with plates to afford protection to the women and children.

The new tin plate plant that the Columbia Steel Corporation plans to erect at Pittsburg, Cal., has aroused interest among exporters to the Far East. In addition to affording earlier delivery of tin plate to Japanese and Chinese merchants and consumers, the plant will have lower ocean freight rates, which may reduce the delivered price by 15c. to 20c. per base box. The ocean freight rate to Japan from Atlantic ports is \$8 per gross ton or about 36c. per 100 lb., compared with a rate from San Francisco of \$4 per net ton, or 20c. per 100 lb.

Large Increase in Fluorspar Imports

Foreign Product Sold in United States in 1927 Equal to 64 Per Cent of Domestic Shipments

WASHINGTON, Oct. 16.—In a pamphlet just issued by the Bureau of Mines, it is pointed out that salient features of the fluorspar industry in 1927 were the decrease in domestic shipments; the pronounced increase in imports from Germany and the equally pronounced decrease in imports from the United Kingdom; the large stocks of fluorspar at consumers' plants on Dec. 31, especially the stocks of 85,000 net tons that accumulated at basic open-hearth steel plants; and the increase in producers' stock piles, which were the largest ever accumulated.

Shipments of fluorspar to steel plants by domestic producers in 1927 were 12 per cent less than in 1926 and there were also decreases of 27 and 21 per cent, respectively, in the shipments of fluorspar for use in foundries and glass plants. Exports in 1927 were the smallest since 1921. In 1927, shipments of fluorspar from domestic mines aggregated 112,546 net tons, valued at \$2,034,728 or a decrease of 13 per cent in both quantity and value as compared with 1926. The general average value per ton f.o.b. mines or shipping points for all grades in 1927 was \$18.08, which is 12c. lower than the average in 1926. Of the total shipments last year, 97,036 tons was gravel fluorspar, valued at \$1,599,310 or \$16.48 per ton at the mines, comparing with 112,092 tons, valued at \$1,868,854, or \$16.67 per ton in 1926.

Of the 1927 output of gravel spar, Kentucky mines supplied 50,533 tons, valued at \$839,933, or \$16.62 per ton,

as against 38,970 tons, valued at \$656,863, or \$16.86 per ton, produced in Illinois mines. Colorado produced 5971 tons and New Mexico 1562 tons. Steel plants in 1927 received 93,196 tons or 82.81 per cent of the production, the average value being \$16.35 per ton at the mines, against 105,614 tons or 82.09 per cent of the 1926 output, with an average value of \$16.51 per ton. Exports in 1927 amounted to only 385 tons, compared with 2132 tons in 1926.

Imports of fluorspar in 1927 amounted to 71,515 tons, valued at \$595,185, and were the second largest ever recorded, having been exceeded only in 1926, when imports were 75,671 tons, valued at \$747,237. The value assigned to the foreign fluorspar in 1927 averaged \$8.32. The cost to consumers in the United States includes, in addition to the duty of \$5 per net ton, loading charges at the docks, the ocean freight charges, and other charges, besides the freight charges from docks to manufacturers' plants. The imports were equivalent to 64 per cent of the total shipments of domestic fluorspar in 1927 compared with 59 per cent in 1926. It is estimated that steel plants consumed 62,115 tons of imported ore in 1927.

According to reports of importers of 44,185 tons of imported fluorspar sold to steel manufacturers in 1927, the selling price of this quantity at tidewater, duty paid, ranged from \$15.71 to \$17.81 and averaged about \$16.47 per ton. The United Kingdom, which has been the chief source of imported fluorspar, supplied only 26

per cent of the total imported in 1927, the imports of 18,449 tons representing a decrease of 37 per cent from 1926. Germany was the chief source of fluorspar imports last year, supplying 31,829 tons or 45 per cent of the total, against 36 per cent of the 1926 total.

In 1927, 138,000 tons of fluorspar was consumed in basic open-hearth furnaces, and at the end of the year these furnaces had stocks aggregating 85,000 tons, the largest on record. In 1926, they consumed 142,000 tons and at the end of the year had 70,000 tons in stock. The average quantity of fluorspar used by individual plants per ton of basic open-hearth steel, the report said, varies widely, usually ranging from 1 to 35 lb. In general, the average is stated to be between 7 and 8 lb.

Fluorspar Duty Report Is Referred to Departments

WASHINGTON, Oct. 16.—It was stated at the White House last Friday that the fluorspar report sent to the President by the Tariff Commission will be sent to the Department of Commerce and then to the Treasury Department before action is taken on it by the President. This is the usual procedure of such reports. The Tariff Commission is said to have recommended that the existing duty of \$5 per net ton be increased 50 per cent to \$7.50, though the report cannot be verified. The increased duty was asked by domestic producers of fluorspar, while the application was opposed by Eastern steel makers, particularly the Bethlehem Steel Co.

Australian Steel Works to Build Coke Plant

WASHINGTON, Oct. 16.—Development and expansion of the Newcastle steel works of the Broken Hill Proprietary Co. will entail an initial cost of £1,000,000 and for the present will be confined to the erection of a by-product coke plant, according to a report received from Trade Commissioner E. C. Squire, Sydney. The equipment is to be of the Coppee type. It is understood that the Coppee company proposes to use the largest possible proportion of Australian material and workmen in the construction of the plant, importing from England only those special materials and skilled technicians not obtainable locally. In some quarters the proposed expansion is taken to indicate the inauguration of a plan to meet competition expected from the newly organized Australian Iron & Steel, Ltd., which is engaged in building steel works at Port Kembla, and also expected from a new German company, which is reported to be preparing to set up a plant at Cessnock, New South Wales, for the production of coal products.

Export Rebates Gain in Favor

German System of Supplying Cheaper Steel to Manufacturers Who Sell Products Abroad May Be Adopted by Other Countries

HAMBURG, GERMANY, Sept. 30.—The success that has attended the German plan of paying rebates on steel bought by manufacturers in Germany who export their products is evidently influencing other European producing countries to adopt similar measures. Application of such a system appears to be desirable for any country with a tariff on steel. Success of the rebate plan in Germany is measured by its advocates in the constantly rising exports of manufactured metal products, such as machinery, bolts, nuts, rivets, wire and general hardware. The non-ferrous metal industry in Germany has adopted a similar plan, and in other lines, such as artificial silk, glass and pottery, steps are being taken to establish rebates on the raw materials entering exported products.

As France, Belgium, the Saar, Austria, Poland and Czechoslovakia have steel tariff schedules, it is considered probable that rebate plans will eventually be introduced in all these producing countries. Austria has already applied a system of rebates patterned after the German plan, and Czechoslovakian mills are expected to reach an agreement with exporting consumers before the end of the year. In France, the Comité des Forges is negotiating with the French steel consumers to the same end, and Belgian manufacturers of bolts, rivets, wire

and machinery are urging the introduction of such a system.

Advocates of a rebate plan point out that a high domestic steel market is a distinct disadvantage to the manufacturer for export, who must meet the competition of foreign makers of the same product who buy exported steel at considerably lower prices. The example of a German manufacturer of bolts at Hagen and a Dutch competitor at Helmond is cited. Both bolt makers may buy their raw material from a mill at Hagen. In the case of the Dutch producer the price is £6 2s. 6d. (\$29.77) per metric ton, to which is added 8 m. (\$1.90) per ton for bolt quality. The German maker would pay 150 m. (\$35.70) per ton, or \$4.03 per ton more than his competitor were it not for the rebate. A British maker of wire or wire nails may buy German wire rods at £6 (\$29.16) per ton, while the German manufacturer buying from the same plant, without the rebate, would pay 159 m. (\$37.84) per ton. It is claimed that in producing countries where no rebates are paid to exporting manufacturers the producer for export finds it necessary to buy abroad, as he receives a return of the greater part of the duty when the manufactured article is exported. This is to the disadvantage of the producers of that country as well as the consumers.

Direct Process Plant Under Construction in Germany

Construction of an experimental plant in Germany by the Friedrich Krupp A. G. and the Vereinigte Stahlwerke A. G., for the purpose of testing the "Norsk-Staal" method of making sponge iron and steel direct from ore (THE IRON AGE, Oct. 4, page 835), has been started, according to a report to the Department of Commerce from the trade commissioner in Berlin. The two corporations cooperating in this experimental work are understood to have been working independently on various processes for some time and finally decided to develop the "Norsk-Staal" method, by which steel is produced at low temperatures with gas. In this process, the iron does not become fluid and the finished product is of a spongy consistency.

It is said that the consumption of gas is not excessive, as it is used repeatedly for reducing the ore. Although a large quantity of electric current is required in converting the sponge iron into steel, it is believed that this can be produced at low cost by using by-product gas.

The annual production at the experimental plant will be about 20,000

tons, and it is said to be the first large experimental venture of the kind in Germany. Other methods, such as that used by the Hoesch Iron & Steel Co., have been employed on a much smaller scale.

German Cities Contract for Steel Dwellings

HAMBURG, GERMANY, Sept. 30.—Rapid progress is being made in steel house construction. Contracts for from 30 to 100 steel dwellings have been awarded by the cities of Munich, Frankfurt, Breslau, Oppeln and Berlin. At present, orders for single houses for individuals cannot be accepted, as output falls considerably short of demand.

Russian Iron and Steel Output Greater Than Year Ago

Russian industrial output in July decreased 9.3 per cent from June, according to preliminary returns of the Supreme Economic Council of the U. S. S. R. Compared with July of last year, however, industrial production showed an increase of 27.1 per cent. In the first 10 months of the

fiscal year, gross industrial output increased 22.2 per cent, compared with the same period of the previous year.

Production of pig iron in July was 268,700 tons, compared with 245,200 tons in July, 1927; steel ingot output was 310,500 tons compared with 284,300 tons, and production of rolled metals was 232,300 tons, compared with 189,100 tons.

New German Company to Sell Ship Steel

HAMBURG, GERMANY, Sept. 30.—A ship steel sales office has been established by the United Steel Works, Düsseldorf, in conjunction with other producers. Both export and domestic business will be handled by the new office, operating as the Schiffbaustahl Verkaufsgemeinschaft G.m.b.H. It is understood that the company may establish some foreign offices.

Turkey Now a Market for Typewriters

HAMBURG, GERMANY, Sept. 30.—Legislation in Turkey compelling the use of Latin letters instead of Arabic has resulted in a considerable demand for typewriters. German and British manufacturers have sent a large number of typewriters to the Government and to schools for free use to introduce their products.

Scrap Dealers Organize in New England

A Southern New England chapter of the Institute of Scrap Iron and Steel, the headquarters of which are at 11 West Forty-second Street, New York, was organized at a meeting of dealers in Hartford, Conn., Oct. 10. Officers elected were Harry S. Blumenthal, Suissman & Blumenthal, Hartford, president; Nathan Katz, Jacob A. Katz & Sons, Hartford, first vice-president; Robert Erlich, Moses Erlich Iron & Metal Co., Springfield, Mass., second vice-president; Harris Botwinick, Harris Iron & Metal Co., New Haven, treasurer; H. Kasden, H. Kasden & Son, New Haven; J. A. Marson, J. A. Marson, Inc., Bridgeport, Conn., and Barney Carlson, Springfield, Mass., members of the executive committee.

This is the third chapter of the institute organized recently, others being the New York and Philadelphia chapters. A dinner meeting of dealers in the Baltimore district is scheduled for Oct. 16 at the Southern Hotel, Baltimore, and a meeting, Oct. 23, at the Berkshire Hotel, Reading, Pa., is expected to be attended by dealers in Reading, Allentown, Bethlehem, Coatesville, Easton, Harrisburg, Lancaster, Lebanon, Pottstown, Pottsville, and York, Pa. Iron and steel scrap dealers of Trenton, N. J., will meet at the Stacy-Trent Hotel, Oct. 17, to consider organization of a local chapter.

Machinery Markets and News of the Works

Machine Tool Orders Large

Tractor Manufacturers and Automobile Companies Buy—
Norfolk & Western Wants Nearly 60 Tools

HEAVY purchasing by tractor manufacturers in the Middle West, considerable business from automobile companies and a generally sustained and diversified demand for single tools were features of machine tool buying during the week. An inquiry from the Norfolk & Western for nearly 60 machines gave new interest to the railroad branch of the market, which has been unusually dull throughout the year.

The Allis-Chalmers Mfg. Co. placed large orders for tools for its Springfield, Ill., tractor plant and the International Harvester Co. bought heavily for its works at Rock Island, Ill.

Much of the business in the Cincinnati, Cleveland and Detroit districts is coming from automobile manufacturers, especially from those putting out new models. Some companies in the Cincinnati district report that fully half of their orders in the week were from the automotive industry. The Olds Motor Works, Lansing, Mich., ordered 10 multiple and double spindle drilling machines. The Mullins Mfg. Co., Salem, Ohio, bought about \$125,000 worth of presses.

The list of the Norfolk & Western consists of a miscellaneous lot of shop equipment. Other roads are inquiring sparingly.

Pending orders for machine tools

are of substantial volume, and indicate that large purchases of shop equipment will continue during the next 30 days at least. Production schedules are taxing the capacity of many machine tools plants. Large unfilled orders make it impossible, in some instances, for tool builders to promise early deliveries.

The National Machine Tool Builders' Association, in its report for September, says that the machine tool orders index continues its upward trend. For the nine months of this year, each month's orders have been above 200 on the association's scale (the figure 100 representing the average shipments for 1922, 1923 and 1924). The base figure of 265 for September was the highest month since March, 1920, which registered 322.3.

"All important factors," says the association, "point to good business for the rest of the year. The metal-working industries have been studying costs and have been making enough money to buy modern equipment to replace old equipment of less efficiency."

Despite the excellence of the general situation, the association sounds a note of caution in saying that "a well known characteristic of machine tool demand is to have some pretty sharp peaks followed by sharp drops."

New York

NEW YORK, Oct. 16.—Machine-tool trade in the Eastern territory continues steady and in fairly good volume but without important feature. Some sellers report business as somewhat quieter, but on the whole there is no complaint.

Niles-Bement-Pond Co. has sold a 62-in. boring mill, a floor boring machine, four Boye & Emmes lathes, Blount speed lathe, United States pedestal grinder, two

Grand Rapids grinders, Niles-Acme 36-in. shaper, and Morris 4-ft. radial drill; Pratt & Whitney division sold two automatic lathes, an engine lathe, two vertical surface grinders, two vertical shapers, eight multiple spindle drills and a jig borer.

Plans are being drawn by Manhattan Refrigerating Co., 521 West Street, New York, for addition to cost about \$100,000 with machinery. Gunvald Aus Co., 244 Madison Avenue, is engineer. T. A. Adams is head.

Dock Department, Pier A, North River, New York, Michael Cosgrove, dock com-

missioner, is planning an appropriation of \$2,750,000 for municipal airport on Barren Island, to be known as Floyd Bennett Field, including \$198,000 for hangars at land plane base; \$66,000 for hangar at seaplane base; terminal buildings at seaplane base, \$20,000; machine tools, \$15,000; wire fencing, \$35,000; water supply system, \$25,000; radio equipment, \$50,000, and electric light and power equipment, \$58,000.

Sinclair Refining Co., 45 Nassau Street, New York, has awarded general contract to Fisher Williams Corporation, 103 Park Avenue, for one-story oil storage and distributing plant at Brooklyn, to cost about \$70,000 with equipment.

Interborough News Co., 244 West Forty-second Street, New York, is having plans drawn for a six-story automobile service, repair and garage building for company motor trucks and cars, to cost about \$180,000 with equipment. Russell G. Cory, 30 Church Street, is architect and engineer.

Charles H. Wilson, 383 Concord Avenue, New York, manufacturer of pyrometers, instrument parts, etc., has filed plans for an addition to four-story factory, including improvements in present structure, to cost about \$35,000.

Felham Manor School Board, Felham Manor, N. Y., is said to be planning installation of manual training equipment in three-story addition to high school to cost about \$500,000. Hart & Shape, 247 Park Avenue, New York, is architect.

Frank J. Ricker, 1328 Broadway, New York, architect, has plans for a two-story automobile service, repair and garage building, to cost about \$155,000 with equipment.

Moth Aircraft Corporation, New York, care of J. A. Ritchie & Co., 52 Wall Street, New York, bankers, recently formed under Delaware laws, plans operation of plant in this vicinity for manufacture of D. H. Moth type of airplanes, including parts and assembling, controlled by De Havilland & Co., London, England, with which exclusive contract has been made for production and sale of such aircraft in United States. Company is arranging for early stock offering to provide financing for operations. Minton M. Warren is head.

I. Rokeach & Son, Inc., 345 Hewes Street, Brooklyn, manufacturer of soaps, etc., has filed plans for four-story unit, 90 x 200 ft., to cost over \$125,000 with equipment. C. G. Preis is company engineer.

Liberty Auto Radiator Co., Jersey City, N. J., care of Flagg & Stades, 665 Newark Avenue, architects, has plans for a new two-story unit, to cost \$30,000 with equipment.

Smith Tool & Mfg. Co., 120 Christie Street, Newark, N. J., has plans for a new one-story plant, 90 x 100 ft., to cost about \$25,000 with equipment.

J. D. Lugosch, 714 Bergenline Avenue, Union City, N. J., architect, has plans for a one-story automobile service, repair and garage building, 155 x 200 ft., at Pater-

The Crane Market

INQUIRIES for overhead and locomotive cranes continue to accumulate, but prospective buyers are slow to place orders. In overhead cranes there is a fair volume of inquiry for hand power equipment and electric cranes of small capacity. Chicago, Rock Island & Pacific will buy two 15-ton overhead electric cranes with auxiliary hoods for delivery at Burr Oak, Ill. Issue of the list of overhead equipment for the new 207th Street yards of the Transit Commission,

New York, is not expected until early next year. The list of locomotive cranes and steam shovels inquired for by Dwight P. Robinson & Co., New York, for use in Argentina, has been awarded to two large builders, one in Ohio and the other in Wisconsin.

Among recent purchases are:

Dwight P. Robinson & Co., New York, seven 10-ton crawl-tread cranes and four 5-ton truck cranes from a Wisconsin builder and two steam shovels from the

Bucyrus-Erie Co., all for shipment to a contract at Buenos Aires, Argentina.

Panama Canal Commission, Washington, 30-ton steam-driven locomotive crane for use at Panama Canal, from Brown-Ing Crane Co.

Algoma Power Co. of Canada, 45-ton overhead electric crane from Northern Engineering Works.

Power Corporation of New York, Watertown, N. Y., 30-ton, one-motor crane from Northern Engineering Works.

son, N. J., to cost about \$140,000 with equipment.

Public Service Electric & Gas Co., Public Service Terminal Building, Newark, N. J., has plans for a two-story equipment storage and distributing plant, 140 x 180 ft., with shop facilities, at Jersey City, N. J., to cost over \$200,000 with equipment.

Lackawanna Railroad Co., 90 West Street, New York, is asking bids until Oct. 30 for one and eight-story storage and distributing building, 343 x 410 ft., at Jersey City, N. J., forming first unit of new terminal project, to cost over \$1,500,000 including mechanical handling and other equipment. G. J. Ray is company engineer.

Brooklyn Ash Removal Co., Inc., office of Department of Street Cleaning, Municipal Building, New York, is asking bids until Oct. 29 for furnaces, air-preheaters, flues and other equipment for three incinerator plants, each with burning capacity of 500 tons per 24 hr., at Brooklyn. Plans and specifications at office noted. Erle L. Collins is chief engineer.

Koeppen Metal Products, Inc., formerly at Union City, N. J., is now located in new plant at Carlstadt, N. J., and may be addressed at P. O. Box 37.

New York Steam Corporation, New York, has let contract for nine-story warehouse, 46 x 100 ft., foot of East Thirty-sixth Street, New York, to Turner Construction Co., 420 Lexington Avenue, New York. G. Denison is engineer.

Bell Telephone Laboratories, Inc., New York, has let contract for new three-story laboratory in Bank Street, 50 x 120 ft., to Turner Construction Co., 420 Lexington Avenue, New York. Voorhees, Gmelin & Walker are architects.

Accurate Fireproof Door Corporation, 425 Barretto Street, New York, has been organized to manufacture fireproof doors, window sash and other fireproof products. Operations will begin about Oct. 22.

New England

BOSTON, Oct. 15.—Contract has been let by United States Rubber Co., 1790 Broadway, New York, to Berlin Construction Co., Berlin, Conn., for one-story addition to plant at Naugatuck, Conn., to cost about \$32,000.

Municipal Light and Power Department, Hudson, Mass., will make extensions and improvements in electric light and power plant, including addition and installation of new equipment, to cost more than \$40,000. L. D. Wood is manager.

Enterprise Mfg. Co., Cambridge, Mass., manufacturer of hot water boilers, copper vessels and other coppersmithing, has

arranged for removal of plant on First Street to one of former factory buildings of Blake & Knowles Pump Co., at Third and Binney Streets, for increased production.

Brockton Gas Light Co., Main Street, Brockton, Mass., has asked bids on general contract for one-story automobile service and mechanical repair shop, 125 x 125 ft., to cost over \$75,000 with equipment. C. H. Tenney Co., 200 Devonshire Street, Boston, is engineer.

Panco Rubber Co., Chelsea, Mass., has awarded general contract to Idell Melnick, Chelsea, for one-story addition to press department, 48 x 100 ft., to cost over \$35,000 with equipment. Schein & Levine, 20 Pemberton Square, Chelsea, are architects.

Texas Co., 31 St. James Street, Boston, is planning two-story addition, 40 x 145 ft., to oil storage and distributing plant at Chelsea, to cost about \$75,000 with equipment. Headquarters are at 17 Battery Place, New York.

New Britain Iron & Construction Co., New Britain, Conn., ornamental and other iron products, has removed its plant from 183 Hartford Avenue to 1283 East Street, where increased production will be carried out.

Kepes & Sattan Co., Parsons Street, Wallingford, Conn., has been organized to manufacture wood handles for screw drivers and similar tools. Factory has been acquired and equipment installed. Company is in market for shavings and dust collector.

Pittsburgh

PITTSBURGH, Oct. 15.—While machine-tool business is not so active as many might wish, there is little real cause for complaint either as to sales or inquiries. Some good business is expected from the Westinghouse Electric & Mfg. Co. which has not yet begun to buy extensively on its fourth quarter list. Another prospect is the Aluminum Co. of America, in connection with expansions at Massena, N. Y., and New Kensington, Pa., while the Pittsburgh Plate Glass Co. is a probable buyer for its new plant at Crystal City, Mo.

Wheel foundry of Pressed Steel Car Co., McKees Rocks, Pa., which has lately been idle, was destroyed by fire Oct. 9. Considerable machinery was lost. H. P. Hoffstot is vice-president and C. W. Wrenshall, general manager.

Property, 48 x 460 ft., for expansion, has been acquired by Pittsburgh Foundry & Machine Co., foot of Thirty-sixth Street, Pittsburgh.

Ovens, power equipment, conveying and

other machinery will be installed in new two-story and basement baking plant to be built by Fishels Co., 233 Fifth Avenue, Pittsburgh, 100 x 240 ft., to cost over \$250,000. Richard Irvin & Co., Vandergrift Building, are architects.

Oil Well Supply Co., 215 Water Street, Pittsburgh, has leased building totaling about 10,000 sq. ft. floor space, for extensions in storage and distributing plant.

Board of Education, Lewistown, Pa., is said to be planning installation of manual training equipment in two-story junior high school to cost \$150,000, for which bids have been asked on general contract. Hersh & Shollar, Commerce Building, Altoona, Pa., are architects.

West Virginia Water Service Co., Bluefield, W. Va., plans extensions and improvements in plant and system, including construction of dam at Ada, W. Va., and installation of pumping and other equipment, to cost over \$150,000.

South Atlantic

BALTIMORE, Oct. 15.—Independent Can Co., Baltimore, care of Edwin A. Parker, head of Parker Metal Decorating Co., Howard and Ostend Streets, recently formed by Mr. Parker and associates with capital of \$1,000,000, is said to be planning construction of new works, to cost more than \$200,000 with equipment.

Crown Cork & Seal Co., 1511 Gullford Avenue, Baltimore, manufacturer of metal bottle caps, bottle-capping machinery and parts, has asked bids on general contract for one and two-story addition, 150 x 600 ft., to cost over \$175,000 with equipment. L. R. White, Hearst Tower Building, is architect.

Storms Aviation Co., Spartanburg, S. C., recently formed by N. E. Storms, Spartanburg, and associates, will operate an airplane and parts manufacturing works near municipal airport, where buildings have been secured, including machine shop and hangar.

Gulf Refining Co., Sydenham and Locust Streets, Philadelphia, is said to be planning construction of new oil storage and distributing plant at Siler City, N. C., to cost about \$40,000 with equipment.

Perel's Fixture Exchange, 241 Harrison Street, Baltimore, store and office fixtures and equipment, has awarded general contract to Abraham Goodman, 2000 Whittier Avenue, for a three-story addition, 54 x 65 ft., to cost about \$35,000. John Freund, 1307 St. Paul Street, is architect.

Board of Education, Easton, Md., is said to be planning installation of manual training department in new high school to cost more than \$200,000, for which bids are being asked on general contract until Oct. 23. Henry P. Hopkins, 347 North Charles Street, Baltimore, is architect.

Following merger of John H. Heald Co., Lower Basin, Lynchburg, Va., manufacturer of extracts, etc., and Mead Paper Board Corporation, Dayton, Ohio, last-noted company is reported planning a new paper mill near Lynchburg, to cost over \$200,000 with equipment.

Covington Machine Co., Covington, Va., E. H. Archer, manager, is planning installation of equipment to manufacture expanded metal lath.

Delco Light Co., Dayton, Ohio, a subsidiary of General Motors Corporation, manufacturer of isolated electric lighting plants, is planning new factory branch and distributing plant at Charlotte, N. C., to cost over \$50,000 with equipment.

Chesapeake & Ohio Railroad Co., Richmond, Va., has completed plans for new engine house, machine shop, blacksmith and forge shop, pipe shop and other units, at Huntington, W. Va., to cost more than \$2,000,000 with equipment.

Philadelphia

PHILADELPHIA, Oct. 15.—Davies Battery & Electric Co., 2016 South Bancroft Street, Philadelphia, has purchased two-story building at 2021-27 South Chadwick Street, 52 x 88 ft., for expansion.

Huck-Gerhardt Co., Inc., Luzerne and G Streets, Philadelphia, is having plans revised for two-story addition to millwork plant, to cost about \$40,000 with equipment. Clarence E. Wunder, 1520 Locust Street, is architect.

Atwater Kent Mfg. Co., Wissahickon Avenue and Abbottsford Road, Philadelphia, manufacturer of radio equipment, has taken title to seven acres adjoining plant, and will expand building program, announced in these columns last week, to include one-story units, to cost more than \$900,000 with equipment. Ballinger Co., Twelfth and Chestnut Streets, is architect and engineer.

Central Airport, Inc., Philadelphia, recently organized by C. Townsend Ludington, president Ludington Philadelphia Flying Service, Inc., Island Road and Tincum Avenue, and associates, has acquired 145 acres at Camden, N. J., and plans construction of airport, including hangars, machine and repair shops and other units. Company is disposing of stock issue to total \$550,000, a considerable portion of fund to be used for airport construction.

Officials of American Brown-Boveri Electric Corporation, 420 Lexington Avenue, New York, have organized a subsidiary, New York Shipbuilding Co., to take over and operate this branch of its properties at Camden, N. J. Parent company will continue to occupy portion of plant, as heretofore, for manufacture of heavy electrical machinery. Both branches of business will be developed for increased output. C. L. Bardo is president of subsidiary organization.

Quality Alloy Casting Co., Easton, Pa., has been organized by T. A. Mellon, 205 First National Bank Building, and associates, to operate plant for manufacture of aluminum, brass, bronze and other metal castings, as well as for production of hardware specialties. J. Clem Kline, R. F. D. No. 3, Easton, is interested in new company.

Delaware School Foundation, duPont Building, Wilmington, Del., is said to be planning installation of manual training equipment in new two-story high school at Newcastle to cost more than \$350,000,

for which plans are being drawn by Gullbert & Bételle, 20 Branford Place, Newark, N. J., architects.

Hazlebrook Coal Co., Mount Carmel, Pa., is said to be planning construction of new electrically-operated coal breaker at its Mid-Valley colliery, near Mount Carmel, to cost more than \$500,000 with machinery.

William Costello Co., Inc., 2536 North Third Street, Philadelphia, has been formed to continue business of former William Costello Co. in manufacture, repair and sales of machinery, machine tools and other equipment. Business is confined largely to biscuit and cake-making machinery.

Glasgow Iron Co., formerly in Harrison Building, Philadelphia, has removed office to Pottstown, Pa.

Harrisburg Foundry & Machine Co., Inc., Harrisburg, Pa., has been formed to succeed Harrisburg Foundry & Machine Works, recently in receivership. New company will continue manufacture of gray iron castings, Harrisburg dual clearance uniflow engine, Harrisburg single valve and Corliss valve engines. C. W. Lynch, who operated company prior to 1920, will be president.

Carpenter Steel Co., Reading, Pa., plans rebuilding plant, including 9-in. and 10-in. rolling mills, wire mill and other units, partly destroyed by fire Oct. 6.

Buffalo

BUFFALO, Oct. 15.—Contract has been let by National Grinding Wheel Co., 2984 Main Street, Buffalo, to L. A. Harding, 1335 Main Street, for new plant at North Tonawanda, N. Y., to cost more than \$50,000 with equipment.

Eisler Mfg. Co., 15 Eisler Terrace, Rochester, N. Y., manufacturer of special tools, has changed its name to Yawman Metal Products, and has increased capital to provide for expansion.

Curtiss Aeroplane & Motor Co., Kail Street, Buffalo, is said to be arranging call for bids for initial units of plant on property recently acquired at Tonawanda, N. Y., consisting of four one-story units, 200 x 1500 ft., 200 x 200 ft., 60 x 200 ft., and 60 x 100 ft., to cost about \$750,000 with equipment.

New York Central Railroad Co., Buffalo, and 466 Lexington Avenue, New York, has plans for new one and two-story car repair shop at East Buffalo yards, to cost over \$65,000 with equipment.

George F. Johnson, head of Endicott-Johnson Corporation, Binghamton, N. Y., manufacturer of shoes, and associates are organizing a local company to be affiliated with Colonial Airways Corporation, 270 Madison Avenue, New York, which is planning establishment of air line between New York and Buffalo. New company plans construction of airport to serve Binghamton, Johnson City, Endicott and vicinity, with hangars, repair and reconditioning shops and other mechanical units, to cost over \$100,000.

Department of Correction, Albany, N. Y., has authorized construction of new mechanical shop building at Auburn State Prison, Auburn, N. Y., to cost about \$225,000 with equipment.

William G. and Frank D. Menihan, 171 Cedar Street, Corning, N. Y., and associates have organized Corning Saw & Supply Co., with capital of \$50,000, to establish and operate local plant for manufacture of saws, files and other cutting tools. Hugh V. O'Brien, 262 West

Second Street, is also interested in company.

Excavation work on three-story addition, 90 x 500 ft., to plant of Ritter Dental Mfg. Co., West Avenue, Rochester, N. Y., has been begun. Building will be used to house business of Electro Dental Mfg. Co., Philadelphia, purchased by Ritter company early in year and which will be removed to Rochester.

Chicago

CHICAGO, Oct. 15.—Heavy purchases by tractor manufacturers have made the past week one of the most active so far this fall. Allis-Chalmers Mfg. Co. has placed orders for its Springfield, Ill., tractor plant and the International Harvester Co. is closing a large list for its Rock Island works. An appropriation for machine tools has been made by A. O. Smith Corporation, Milwaukee, and it is probable that revised bids will be taken on a list sent out several weeks ago. Machine-tool manufacturers' west of Chicago are in the market for miscellaneous equipment.

The Chicago, Milwaukee, St. Paul & Pacific is asking for prices on a 24-in. Gould & Eberhardt shaper, a 2 x 24-in. turret lathe and an 18-in. x 12-ft. selective-head engine lathe. The Chicago Board of Education will buy a 30-in. band saw for the Medill High School.

Norfolk & Western Railroad has issued the following list:

- One No. 6 Brown & Sharpe automatic screw machine, motor driven.
- One 20-in. x 8-ft. motor-driven engine lathe with taper attachment.
- One 48-in. carwheel borer, motor driven.
- One crankpin turning machine.
- One core oven, 8 ft. 6 in. wide, 17 ft. 6 in. deep, 11 ft. 6 in. high.
- Two 20-in. vertical drills, motor driven.
- One Foley saw filing machine.
- One 24 x 6-in. heavy-gear cutting machine, motor driven.
- One internal grinding machine for holes 1 1/2 to 5-in. diameter x 3 to 8 in. deep.
- Eight 8 x 30-in. plain external grinding machines.
- One model D Walker grinding machine.
- One locomotive flue grinder.
- Five 18 x 3-in. motor-driven double floor grinders.
- Five 2 1/2 x 12-in. motor-driven double floor grinders.
- Two 1 x 6-in. motor-driven double floor grinders.
- One 1 x 6-in. motor-driven floor buffer grinder.
- Two 1-ton electric hoists.
- Two 2-ton electric hoists, 20-ft. lift.
- One Rockwell hardness tester.
- One 16 x 8-ft. tool-room lathe, motor-driven.
- Two No. 1-A Warner & Swasey turret lathes.
- One No. 3-A Warner & Swasey turret lathe.
- One heavy-duty axle lathe.
- Two gap axle lathes.
- One 42-in. carwheel turning lathe.
- One 36 x 36-in. x 16-ft. three-head, planer-type milling machine.
- One 24 x 6-in. single surface planer.
- One Tabor hinged roll-over core machine.
- One nibbling machine, motor driven, 24-in. throat.
- One 36-in. heavy-duty open-side planer.
- One Peerless portable hydraulic pinion puller.
- One locomotive-flue roller.
- One motor-driven heavy-duty hack saw.
- One No. 470 Fay & Egan motor-driven scroll saw.
- One 36-in. heavy-duty shaper.
- One 48-in. tinnern's foot-power squaring shear.
- One 12-in. Universal head slotter, head to swivel 15 deg.

Pressed Steel Car Co., 13600 Brainard Street, Chicago, will build a one-story boiler house, 72 x 80 ft.

Chicago, Rock Island & Pacific is building a new car shop, 75 x 500 ft., at Burr Oak, Ill.

A new assembly and storage plant, 220 x 240 ft., and a research and experimental building, 36 x 80 ft., both one story, are under way at plant of Wood Brothers Thresher Co., Des Moines, Iowa, and will represent an investment of \$60,000.

International Harvester Co., 606 South Michigan Avenue, Chicago, has asked bids on general contract for one-story foundry, 160 x 320 ft., and two-story motor truck unit, 90 x 520 ft., at Rock Island, Ill., to cost more than \$600,000 with equipment. W. D. Price is superintendent of construction.

City Council, City Hall, Minneapolis, Minn., has awarded general contract to Standard Construction Co., Plymouth Building, for one-story machine shop and equipment storage and distributing building to cost \$40,000. A. M. Larson, City Hall, is architect.

National Airways Corporation, care of Jameson & Harrison, Peoria Life Building, Peoria, Ill., architects, has plans for new aircraft manufacturing plant at Peoria, where site has been secured on Mount Hawley Road.

Public Service Co. of Colorado, Denver, Colo., will build a new one-story steam-operated electric power plant at Alamosa, Colo., to cost about \$45,000 with equipment. Work will be carried out in connection with expansion program in Alamosa district to cost about \$125,000.

Gulf States

BIRMINGHAM, Oct. 15.—Rome Electric Range Co., Huntsville, Ala., has awarded general contract to George A. Rodgers, Huntsville, for initial unit of new plant, one-story, 50 x 250 ft., including foundry and machine shop.

Bemis Brothers Bag Co., 601 South Fourth Street, St. Louis, has approved plans for power house, 49 x 50 ft., at proposed new mill at Talladega, Ala., with machine shop and other units, project to cost more than \$2,000,000. J. E. Shirrine & Co., Greenville, S. C., are architects and engineers.

Board of Commissioners, City Hall, Mobile, Ala., is asking bids until Oct. 26 for equipment for municipal pumping stations, including four motor and gasoline engine driven horizontal centrifugal pumping units, each with capacity of 5200 gal. per min., with auxiliary equipment. Wright Smith is city engineer.

Weatherford, Mineral Springs & Northwestern Railway Co., Weatherford, Tex., will rebuild part of engine house, tool and equipment shops at Weatherford, recently destroyed by fire.

Ford Motor Co., Detroit, is having plans drawn for a new one-story factory branch, service and repair building, 125 x 170 ft., at Meridian, Miss., to cost about \$60,000 with equipment. P. J. Krouse, M. & W. Building, Meridian, is architect.

Richardson Refining Co., Big Spring, Tex., is erecting new oil refinery with initial capacity of 5000 bbl. per day, to cost about \$750,000 with equipment.

Ouachita Iron Works, Inc., Monroe, La., is planning construction of new foundry,

machine, forge and welding shops, and other units, to cost more than \$60,000 with equipment.

Republic Portland Cement Co., San Antonio, Tex., an interest of Smith Brothers Properties, Inc., 121 Villita Street, will proceed with construction of new cement mill units at Longhorn, near San Antonio. A housing development for employees is included. Project will cost more than \$300,000. Terrell Bartlett Engineers, Inc., Calcasieu Building, is engineer.

Houston Lighting & Power Co., Houston, Tex., has awarded general contract to Don Hall, Cotton Exchange Building, for three-story and basement equipment storage and distributing plant, 100 x 150 ft., including repair department and garage, to cost \$250,000 with equipment. Robert J. Cummings, Bankers' Mortgage Building, is consulting engineer.

Houston Gulf Gas Co., San Antonio, Tex., is planning construction of new natural gas pipe line from Jennings gas field, Zapata County, to Monterey, Mexico, about 140 miles, to cost more than \$650,000 with compressor stations and other equipment.

Texarkana & Fort Smith Railway Co., Texarkana, Tex., operated by Kansas City Southern Railway Co., Kansas City, Mo., is completing plans for new locomotive shops at Dowling, near Port Arthur, Tex., where home site will be developed for employees, to cost more than \$300,000 with equipment.

D. S. Mair Machinery Co., Houston, Tex., has been appointed agent in Texas for Whiting Corporation, Harvey, Ill., to handle Whiting and Swenson lines.

Indiana

INDIANAPOLIS, Oct. 15.—Wheeler-Schebler Carburetor Co., Inc., 1302 Barth Avenue, Indianapolis, has awarded general contract to Schlegel & Roehm, 602 Lexington Avenue, for three one-story plant units, to cost about \$65,000 with equipment. D. A. Bohlen & Son, Majestic Building, are architects.

Delco-Remy Corporation, Anderson, manufacturer of automobile starting and lighting equipment, has approved plans for one-story addition to plant at Dayton, Ohio, 75 x 120 ft., to cost about \$50,000 with equipment. A 15-ton traveling crane will be installed.

Auburn Automobile Co., Auburn, Ind., has plans by Austin Co., Cleveland, for one-story plant unit at Connersville, 80 x 100 ft., to cost about \$80,000 with equipment.

Wayne Pump Co., Fort Wayne, Ind., manufacturer of self-measuring gasoline pumps, tanks, air compressors, etc., has acquired Boyle-Dayton Co., Los Angeles, manufacturer of kindred equipment, and will operate as a Pacific Coast division, changing name to Wayne-Dayton Co. Los Angeles plant will be continued for present line, as well as for assembling of Wayne type pumps for coast distribution, expansion will be carried out.

General Motors Corporation, Detroit, is having plans drawn for a two-story service, repair and parts plant at Indianapolis, to cost about \$150,000, for one of its manufacturing divisions not yet announced. Albert Kahn, Inc., Marquette Building, Detroit, is architect and engineer.

Cleveland

CLEVELAND, Oct. 15.—Machine tool business continues good in single orders which are coming largely from plants affiliated with the automotive industry. Some forging and stamping companies are adding to their tool room equipment. Buyers usually want quick shipments, but a number of manufacturers are slow on deliveries. Not a great deal of business is coming at present from the automotive industry in the Michigan territory, although the Olds Motor Works, Lansing, during the week purchased ten multiple and double-spindle drilling machines.

Other orders during the week included a 6-in. vertical shaper purchased by Defiance Pressed Steel Co., Defiance, Ohio, and two double-spindle drilling machines bought by Cleveland Tractor Co., Cleveland. Presses continue in good demand. Mullins Mfg. Co., Salem, Ohio, bought two toggle and four double-crank presses the past week. This order amounted to approximately \$125,000. These machines comprise a first unit to be purchased for equipping an extension to be erected by the Mullins company. It is understood that four additional similar units will be required.

Western Stamping & Mfg. Co., which has had its headquarters in St. Paul, Minn., has acquired a plant with 30,000 sq. ft. of floor space on Settlement Road, Parma, a Cleveland suburb, and will move its general offices to Cleveland. This company for some time has been operating a branch factory at 2798 East Eighty-third Street, Cleveland. It conducts a general sheet metal stamping business and also manufactures automobile license plates and highway signs. T. R. Willwerheid is president, and B. A. Preus general sales manager.

Precision Castings Co., Syracuse, N. Y., has purchased a site on Berea Road, near West 117th Street, Cleveland, and will erect a plant to manufacture die castings.

Wasmer Bolt & Nut Co., Cleveland, recently incorporated, will establish its plant in Bramley Storage & Power building, Athens Avenue.

Stebbens & Rich Brass Mfg. Co., Cleveland, recently organized, will establish plant at 6723 Denison Avenue, to manufacture plumbing supplies.

Cleveland Metal Hose Co., has been incorporated and is erecting a plant at 3710 East Ninety-third Street, to manufacture metal hose. Edward S. Pierce is president and general manager.

Fisher Machine Co., Toledo, Ohio, maker of production machines and tools, formerly at 607 Jefferson Street, is now operating in its new plant at 2109 Canton Avenue.

Gifford Metal Specialties Co., Inc., Toledo, has acquired Lober Radiator & Mfg. Co., 126-134 Eleventh Street, and is operating at that location, specializing in stamping, metal spinning and sample work. A. C. Gifford is president and general manager.

Lorain Automatic Icer Co., Lorain, Ohio, has been organized to manufacture automatic refrigerators. Factory at Lorain has been leased where compressors for unit will be made. Refrigerators and other parts will be purchased and assembly work done at factory. H. E. Hageman, secretary Lorain Telephone Co., is president.

Contract has been let by Lyons Machine Co., 5601 Tillman Avenue, Cleveland, to D. Gilchrist Co., Berea, Ohio,

for one-story addition to machine shop, 50 x 50 ft., to cost about \$30,000. W. G. Caldwell, Ontario and St. Clair Avenues, is architect.

Citizens Necessities Co., Toledo, Ohio, George C. Shepard, vice-president and general manager, is planning construction of two ice-manufacturing plants to cost more than \$400,000 with machinery.

Selberling Rubber Co., Akron, Ohio, manufacturer of automobile tires and tubes, is planning an expansion and improvement program to cost more than \$400,000.

Cleveland Cutter & Reamer Co., 7406 Madison Avenue, Cleveland, plans one-story addition, 39 x 80 ft., to cost about \$35,000 with equipment.

Willys-Overland Co., Toledo, has awarded general contract to H. J. Speiker & Co., Elm and Utica Streets, for one-story addition to plant on Central Avenue, to cost about \$100,000 with equipment.

Board of Education, Maple Heights, Ohio, contemplates installation of manual training equipment in new high school to cost \$225,000, for which plans will be drawn by A. M. Allen Co., 7016 Euclid Avenue, Cleveland, architect and engineer.

Cincinnati

CINCINNATI, Oct. 15.—That machine-tool sales in the first half of October were sustained at the high level which prevailed in September is the report of local builders. Much of the business is coming from automobile manufacturers, especially from those putting out new models. In some cases orders from the Detroit district are as high as 50 to 60 per cent of current bookings, although the average for the entire market probably would be somewhat less.

Tractor makers have bought small quantities of tools for expanding output, and airplane companies still are a buying factor of consequence. Pending orders are of substantial volume and give promise of a continuation of heavy purchases during at least the next 30 days. Meanwhile, production schedules are taxing the capacity of certain local machine-tool plants, the unfilled orders of which are large.

Cincinnati Car Co., Cincinnati, manufacturer of street cars and industrial locomotives, and Versare Corporation, Albany, N. Y., maker of buses, trackless trolleys and trucks, are to be merged and production centered at Cincinnati. Plans have been approved by boards of directors and await ratification by stockholders.

Ohio Steel Foundry Co., Lagonda Avenue and Gothic Street, Springfield, Ohio, is considering three-story plant unit, 60 x 150 ft., to cost more than \$50,000.

City Council, City Hall, Cincinnati, C. O. Sherrill, city manager, has plans for development of Luken municipal airport in East End section, including hangars, repair and reconditioning shops, and other units, to cost \$375,000. Kruckemeyer & Strong, St. Paul Building, are architects.

Air Corps, Material Division, Wright Field, Dayton, Ohio, is asking bids until Oct. 29 for tow target windlasses and tow target windlass parts, circular 132.

Tennessee Enamel Mfg. Co., Cleveland, Tenn., recently organized by W. B. Evans, Sterling Court, Nashville, Tenn., and as-

sociates, has awarded general contract to W. L. Halley & Co., 314 Forty-second Avenue North, Nashville, for initial unit of new plant, 200 x 200 ft., on 7-acre tract, to manufacture metal enameled products, to cost more than \$80,000 with equipment.

Board of Water Commissioners, 105-7 North Second Street, Memphis, Tenn., is asking bids until Nov. 7 for a steam turbine reduction gear-driven centrifugal pumping unit and condensing auxiliaries, with capacity of 15-million gal. per day; and one secondary hydraulic-driven pumping unit, with capacity of 1-million gal. per day. James Sheahan is general superintendent.

R. J. Smith Co., Somerset, Ky., plans installation of electrically-operated cold storage plant, to cost about \$40,000 with equipment.

Board of Education, Owensboro, Ky., plans construction of manual training shop for colored students at Western School, and has authorized fund of \$150,000 for this and other school expansion.

Atlantic Ice & Coal Co., Atlanta, Ga., is planning new ice-manufacturing plant at Knoxville, Tenn., to cost about \$180,000 with machinery.

Milwaukee

MILWAUKEE, Oct. 15.—The first half of the month has witnessed further developments in business of machine-tool builders, and dealers also have been greatly encouraged by the volume of transactions. Machine-tool plants as a rule, are operating at capacity, with some working overtime and night shifts in an effort to make specified deliveries.

Belle City Malleable Iron Co., Racine, Wis., which is completing an addition, 77 x 96 ft., has placed contracts with Nelson & Co., local builders, for a power plant addition, 50 x 81 ft., two stories. Engineers are A. A. Wickland & Co., 205 West Wacker Drive, Chicago. C. S. Anderson is secretary-treasurer and general manager.

Badger Foundry Co., Holborn and De-Koven Avenues, Racine, Wis., is starting work on a core-room addition, 70 ft. square, and is inquiring for core-oven equipment.

Vollrath Co., Sheboygan, Wis., manufacturer of enameled utensils and ware, has plans by Richard Philipp, architect, 405 Broadway, Milwaukee, for a one-story addition, 150 x 160 ft., for manufacturing, storage and warehousing. Contracts will be let about Oct. 20.

Gillette Rubber Co., 799 Wisconsin Avenue, Eau Claire, Wis., has placed general contract with Hoepfner-Bartlett Co., local, for a one-story addition, 128 x 200 ft., with foundations for three additional stories. Present work will cost about \$50,000, exclusive of equipment.

Standard Oil Co. of Indiana plans an investment of over \$75,000 in warehouse, tank storage and garage building at Wisconsin Rapids, Wis. Plans are being made by R. N. Allen, company engineer, 910 South Michigan Avenue, Chicago.

Wisconsin Creameries, Inc., 342 Sixth Street, Milwaukee, will spend \$200,000 in construction and equipment of a three-story refrigerator house and distributing plant, 105 x 152 ft. M. Tullgren & Sons Co., 20 Prospect Avenue, are architects.

Detroit

DETROIT, Oct. 15.—Bean Spray Pump Co., Lansing, Mich., is planning one-story addition, to cost about \$40,000 with equipment. J. N. Churchill, Lansing, is architect.

Joseph N. Smith Co., 5914 Federal Avenue, Detroit, manufacturer of automobile hardware, has awarded general contract to Wood Co., Ford Building, for two-story addition, 150 x 800 ft., to cost about \$200,000 with equipment. Smith, Hinchman & Grylls, Marquette Building, are architects and engineers.

Motor Wheel Corporation, Lansing, is reported planning one-story addition, 200 x 220 ft., for wire wheel division, to cost more than \$175,000 with equipment. Another unit will be built for hub production.

Firestone Tire & Rubber Co., Akron, Ohio, has awarded general contract to Owen-Ames-Kimball Co., Grand Rapids, Mich., for four-story factory branch and distributing plant at Grand Rapids, to cost about \$115,000 with equipment.

Board of Supervisors of Wayne County, Court House, Detroit, has authorized purchase of property at Goddard and Middle Belt Highways for new County airport, and has provided for fund of \$2,000,000 for establishment, including hangars, repair and reconditioning shops and other units.

Department of Public Works, City Hall, Detroit, is asking bids until Nov. 14 for equipment for new Connors Creek pumping plant, to cost \$1,250,000 with machinery. B. A. Fellows, City Hall, is city engineer.

Nichols & Shepard Co., Marshall Street, Battle Creek, Mich., manufacturer of agricultural implements, is planning one-story addition, 100 x 400 ft., with smaller unit, 90 x 100 ft., to cost more than \$225,000 including equipment.

Heney Motor Corporation, Freeport, Ill., has purchased plant and business of Weatherproof Body Corporation, Corunna, Mich., and will continue operations as a division of its business. E. C. Morine, heretofore president and general manager of Weatherproof company, will continue with purchasing company, acting as manager of Corunna plant.

Crane Co., 836 South Michigan Avenue, Chicago, is completing plans for one-story factory branch and distributing plant at Detroit, including pipe shop, to cost more than \$100,000 with equipment. Weston & Ellington, Stroh Building, are architects.

Wilcox-Rich Corporation, 6-240 General Motors Building, Detroit, has been formed as consolidation of Rich Products Corporation and Wilcox Products Corporation to manufacture automobile valves, tappets and piston rings. Plant formerly maintained at Detroit by Wilcox corporation is being removed to Marshall, Mich., and some additional machinery is being purchased at Battle Creek and Saginaw, Mich., plants. C. H. L. Flinterman, formerly president of both corporations, is president of consolidated organization. He was previously vice-president and general manager Detroit Pressed Steel Co. and prior to that vice-president Midland Steel Products Co.

Michigan Steel Tube Products Co., Buffalo Street, Detroit, will make extensions and improvements to cost \$300,000. Plans include added manufacturing equipment and extensions to manufacturing building and steel storage buildings. When completed company will have monthly capacity of 5,500,000 ft. of electrically welded steel tubing.

St. Louis

ST. LOUIS, Oct. 15.—Contract has been let by Brass & Copper Sales Co., 1712-14 Chestnut Street, St. Louis, to A. H. Haeseler Building & Contracting Co., Wainwright Building, for a two-story and basement storage and distributing plant, 50 x 130 ft., to cost about \$65,000 with equipment. Klipstein & Rathman, Security Trust Building, are architects.

General Auto & Body Co., 1115 South C Street, Fort Smith, Ark., is planning installation of equipment for repair and reconditioning of automobile bodies, fenders, motor truck and bus bodies, etc. J. E. Finney is in charge.

Evans-Wallower Lead Co., 118 East Fourth Street, Joplin, Mo., is arranging for a preferred stock issue of \$1,125,000, proceeds to be used primarily for erection of new electrolytic zinc plant at East St. Louis, Ill.

Kroger Grocery & Baking Co., 3801 Vista Avenue, St. Louis, has plans for one-story motor truck repair and reconditioning shop, with garage unit, 107 x 360 ft., to cost more than \$100,000 with equipment. Emil H. Nieman, 3816 Shaw Avenue, is architect.

Independent Oil & Gas Co., Tulsa, Okla., has work under way on pipe line to refinery at Okmulgee, Okla., and will increase capacity of refinery from 5000 to 10,000 bbl. per day. Plans are under consideration for installation of pipe line from Okmulgee to point in Greenwood County, Kan., to connect with present line running to Kansas City refining plant.

Home Fertilizer Co., Little Rock, Ark., is planning new plant at Texarkana, Ark., to cost about \$50,000 with equipment. Martin E. Williams is general manager.

Board of Education, Genoa, Neb., is said to be planning installation of manual training shop in two-story high and grade school to cost about \$120,000, for which plans are being drawn by G. Grabe, 304 East Sixth Street, Fremont, Neb., architect.

Pacific Coast

SAN FRANCISCO, Oct. 11.—Imperial Irrigation District, El Centro, Cal., will arrange bond issue of \$1,700,000 for construction of three hydroelectric power plants, utilizing water of valley canals; also bond issue of \$1,800,000 for extensions and improvements in drainage system, pumping system, etc. M. J. Dowd is chief engineer.

Board of Education, Phoenix, Ariz., plans installation of manual training equipment in new high school to cost more than \$400,000, for which bids have been asked on general contract. Lescher & Mahoney, Phoenix, are architects.

Crane Co., San Francisco, and 836 South Michigan Avenue, Chicago, has plans for new one-story factory branch and distributing plant at Emeryville, Cal., to cost close to \$75,000 with equipment.

Union Oil Co., Mills Building, San Francisco, has awarded general contract to William C. Keating, Central Bank Building, Oakland, for new storage and distributing plant at Emeryville, Cal., to cost about \$100,000 with equipment. Engineering department of company is in charge.

Sethman Generator Co., Denver, Colo., manufacturer of electric generating apparatus, is said to be planning construction of new plant at Santa Ana, Cal., and will later remove entire plant to that location, where production will be con-

centrated. Project will cost about \$100,000.

Board of City Trustees, Alturas, Cal., is considering installation of a municipal electric light and power plant to cost about \$150,000, including power lines.

Puget Sound Power & Light Co., Seattle, has authorized construction of first unit of new steam-operated electric power plant on Lake Washington, near Renton, with capacity of 35,000 kw., to cost about \$5,000,000 with transmission lines. Later additional units of like size will be constructed, to develop total output of 210,000 kw.

National Paper Products Co., Church Street, Stockton, Cal., will soon begin superstructure for new two-story plant, to cost about \$90,000 with machinery. General contract has been let to Barrett & Hilp, 918 Harrison Street, San Francisco. Leland Rosener, 233 Sansome Street, San Francisco, is engineer.

Ontario and Chaffey Union High School District, Ontario, Cal., is having plans drawn for an addition to mechanical arts building, to cost about \$35,000 with equipment. An industrial high school unit is also planned. Allison & Allison, Hibernian Building, Los Angeles, are architects.

Canada

TORONTO, Oct. 15. — Machine-tool sales, while mostly in units of one or two, total a good volume. A few small lists have recently appeared and others for complete new plant equipment are in preparation. The automotive industry is showing more interest in the market and some extensive buying is expected for new works. A good demand for equipment is coming from pulp and paper mills, power development, mining and wood-working plants. Second-hand tools are also moving well.

Dominion Alloy Steel Corporation, Sarnia, Ont., is arranging for installation of equipment to double present capacity.

Canadian Goodrich Co., Kitchener, Ont., will erect an addition to its plant to cost \$250,000, which will provide 35 per cent increase in production.

Factory at Dundas, Ont., owned by Jones Brothers Co., Ltd., manufacturer of show cases, office furniture, etc., was damaged by fire Oct. 12, with a loss of \$30,000. It will be rebuilt and new equipment installed.

Anglin-Norcross, Ltd., Temple Building, Toronto, general contractor, has awarded a number of sub-trades for \$150,000 addition to plant of Flint Paint & Varnish Co., Ltd., Perth Avenue. Construction work will be started immediately.

Church Ross Co., Ltd., 698 St. Catharine Street West, Montreal, has let sub-trades for \$235,000 addition to plant of American Can Co., 2065 Jeanne d'Arc Street.

Northern Rubber Co., Metcalfe Street, Guelph, is asking bids for erection of factory to cost \$50,000. James, Proctor & Redfern, Ltd., Excelsior Life Building, Toronto, are engineers. It will be two stories and basement, 60 x 120 ft.

A. H. Coplan, 7 Elemor Avenue, Ottawa, Ont., will build an addition to iron and steel foundry at Hull, Que., to cost \$250,000.

N. Slater Co., Sydney Street, Hamilton, Ont., manufacturer of hardware specialties, etc., will build a two-story addition, 100 x 160 ft., to cost \$25,000. Mitchell

& Riddell, 46 Head Street, have general contract.

B. Greening Wire Co., Ltd., 55 Queen Street North, Hamilton, Ont., has let contract to Stuart Brothers, 15 Hyde Park Avenue, for one-story addition.

Foreign

PLANs are under way by Soviet Russian Government for purchases of agricultural implements, tractors, and kindred equipment. S. S. Loboff, vice-president of Supreme Economic Council of Government, accompanied by other members of Council, has arrived in United States primarily for this purpose and will make headquarters at offices of Amtorg Trading Corporation, 165 Broadway, New York, official buying agency for Soviet Government. Another delegation headed by W. Korobovkin, president of Embanefit, one of three large oil producing organizations in Soviet Russia, has also arrived in United States to purchase oil refining equipment and other oil field apparatus, including storage and distributing equipment, and also will make headquarters at Amtorg Trading Corporation offices.

Electric Bond & Share Co., 2 Rector Street, New York, has purchased electric properties in Chile and Mexico of Whitehall Electric Investments, Ltd., London, to be operated by American & Foreign Power Co., a subsidiary of purchasing company. Acquisitions include companies in Santiago and Valparaiso, Chile; Tampico, Puebla and Vera Cruz, Mexico. Sale involves about \$50,000,000. New owner plans expansion and improvements.

Commonwealth Department of Works and Railways, Chelford House, Flinders Lane, Melbourne, Australia, is planning construction of new railroad in Western Australia, known as the Elandring, and is expected to ask bids for equipment and supplies at once. Project will cost about \$2,000,000.

Gronberg & Co., Dickursby, near Helsingfors, Finland, have approved plans for a new plant for production of carbon dioxide, white lead and kindred products, to cost more than \$400,000. Company is operating with capital of 3,600,000 Finnish marks.

Graham-Paige Motors Corporation, Detroit, has acquired property at Johannisthal, Germany, with building totaling about 57,000 sq. ft. for establishment of new assembling plant.

New Trade Publications

Kinite Dies and Tools.—Kinite Corporation, Milwaukee. Booklet No. 11 describes this patented alloy steel which may be cast in intricate shapes, forged if necessary, and machined. It is said to heat-treat and air-harden with negligible distortion and to resist heavy pressures without change in dimension.

Gasoline Locomotives.—Mid-West Locomotive Works, Hamilton, Ohio. Booklet of 24 pages describing gear-driven gasoline locomotives in four sizes, from 4 to 10 tons. Specifications for the 10-ton unit show four speeds up to 13½ miles an hour. Illustrations show both details and installation views.

Dry Coke Quencher.—Dry Quenching Equipment Corporation, 200 Madison Avenue, New York. Folder DQ-3 of six pages illustrates and describes the Sulzer dry quenching equipment for coke. The unit shown has a capacity of 15 tons in 24 hr. It uses the heat to produce steam.

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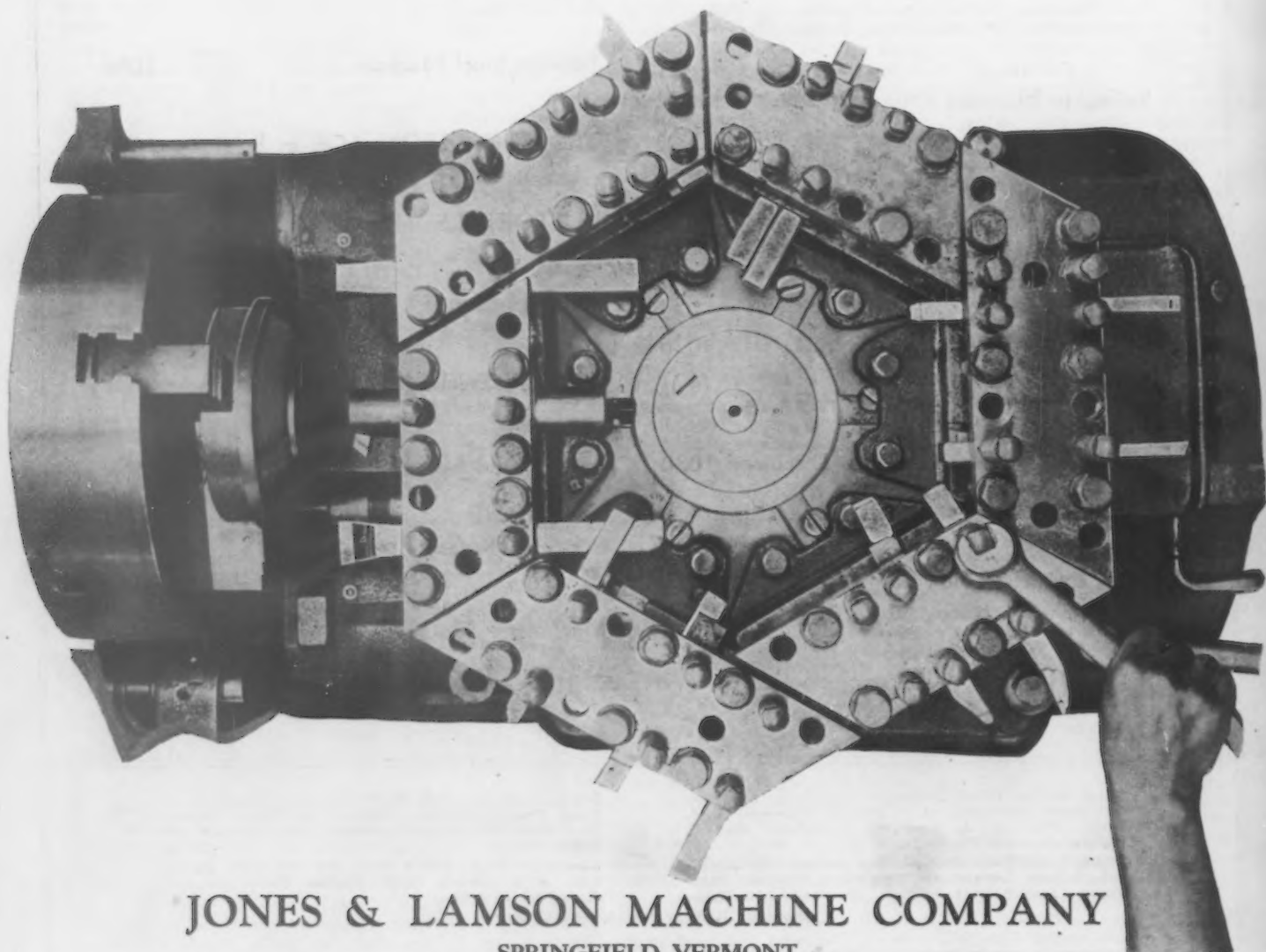
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